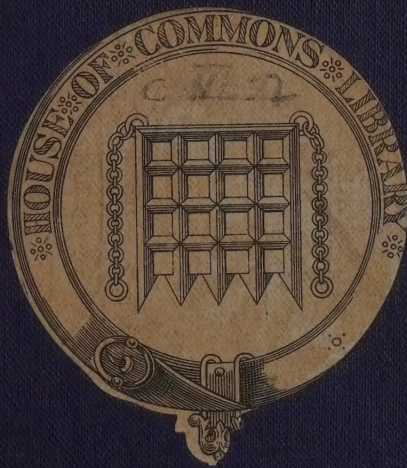
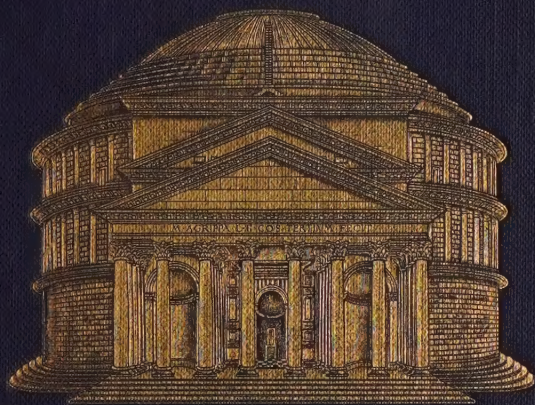




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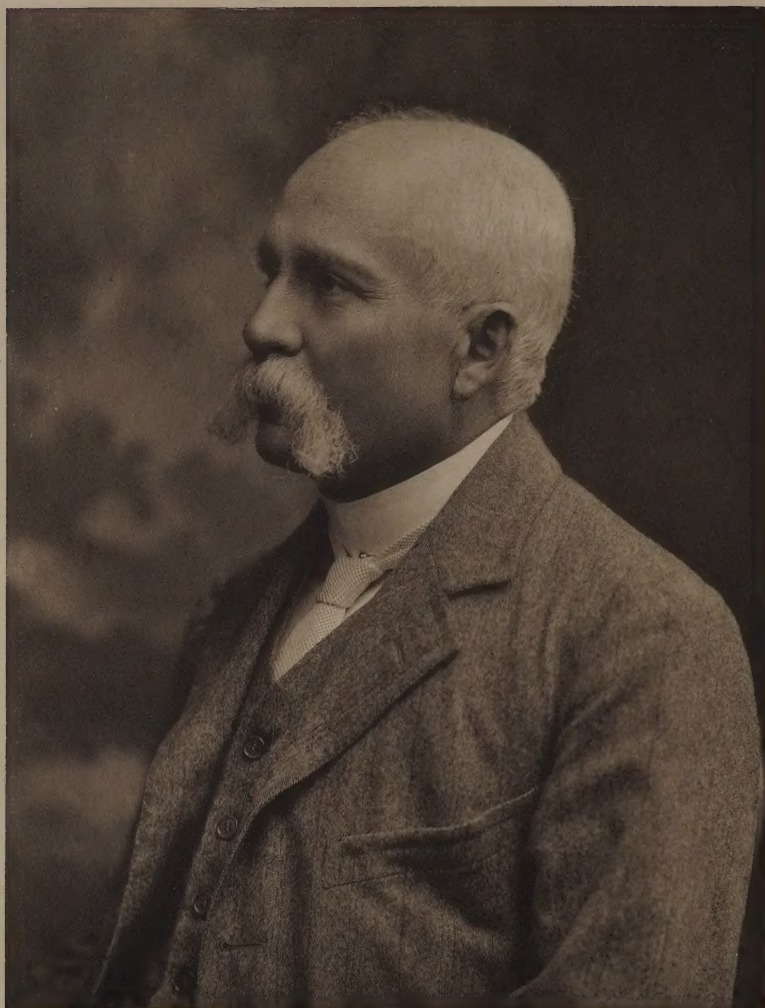
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ROMAN ARCHITECTURE

AND ITS PRINCIPLES OF CONSTRUCTION
UNDER THE EMPIRE

WITH AN APPENDIX ON THE
EVOLUTION OF THE DOME UP TO THE XVIITH CENTURY

By G. T. RIVOIRA

Translated from the Italian by G. McN. RUSHFORTH



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AUTHOR'S PREFACE

IT was in the reign of Augustus, the founder of the Roman Empire, that Vitruvius described the methods of building in his treatise 'Of Architecture', a book which, in spite of its defects and omissions, still enjoys a vigorous life, and will continue to do so as long as the study of ancient architecture is valued, or until an invasion of barbarism has destroyed the last copy.

I, in my turn, have written this volume in the reign of Victor Emmanuel III, under whom the union of Italy has been completed ; and, what is more, during the Great War for the freedom of the world. No longer able to fight for my country in arms, I have endeavoured to serve her and the cause of knowledge with my pen.

My book is in a sense a continuation of Vitruvius, some of whose omissions it supplies, and some of whose statements it explains. In it I have traced the historical connexion and development of the constructive and statical processes which the vaulting systems of Imperial Roman architecture involved : systems in which the Roman builders took the lead, and which were the highest expression of their constructive skill.

Great authorities have in the past laboured the same theme, but with other objects in view, and other methods. Their personal and immediate knowledge of the buildings was more or less limited, and they have failed to lift with a free hand the veil which still conceals not only the true relations between the vaulted architecture of Imperial Rome and the preceding or contemporary styles, but also the creation and originators of the principal elements which characterized that architecture.

In carrying out my task I have assumed the role of archaeologist, architect, and historian. In spite of its inevitable deficiencies, my work will, with the necessary particularization, amplification, and correction, form a guide to the main road to be followed by students of Roman Architecture, that school in which the builders of the Middle Ages and the Renaissance found most to learn.

G. T. RIVOIRA.

ROME, *February* 1919.

TRANSLATOR'S PREFACE

THIS translation has been a much more difficult task than that of the Author's previous works which I carried out under his supervision, because he was no longer at hand to correct my version or interpret the original when necessary. I must therefore ask for the indulgence of the critic and reader if my rendering sometimes appears faulty or obscure. Otherwise I have endeavoured to perform my task on the same principle that I applied to the volumes on Lombardic and Moslem Architecture ; that is to say, I have tried to give a faithful rendering of the author's words, without attempting to recast his sentences, or to give them a turn other than that of the original. In a very few cases, new facts or considerations have led to the omission of statements which had become untenable ; and on similar grounds, when necessary, I have added some notes (enclosed in square brackets) giving fresh information or references.

This translation could never have been carried out with such success as it may be thought to have achieved, had it not been for the devoted and unceasing care and assistance of Mrs. Rivoira. Her insight and her knowledge of her husband's methods have been invaluable ; and, moreover, she has been indefatigable in helping me to clear up the meaning of obscure terms, and in ascertaining the exact facts about details of buildings which were essential to the understanding of the author's meaning. The additional illustrations (among which special attention may be called to those of the dome of San Giacomo degli Incurabili) are also due to her energy and zeal. She, too, has been chiefly responsible for collecting the information on which my biographical sketch of the author has been based.

In the next place my thanks are due to my friend, Dr. Thomas Ashby, the Director of the British School at Rome, whose knowledge of the facts and literature of Roman topography, unequalled in the English-speaking world, has been freely placed at my service. Many of my additional notes are due to his suggestions or information. Mrs. Arthur Strong, the Assistant Director of the School, has also on occasion given me her valuable help. Finally I am indebted to two of Rivoira's English friends, specially qualified by personal intimacy and familiarity with his studies to speak about him—Sir Charles Oman and Professor J. B. Bury—for the reminiscences with which they have enriched my biographical sketch.

G. McN. RUSHFORTH.

March 14th, 1925.

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BIOGRAPHICAL NOTE

GIOVANNI TERESIO RIVOIRA was born on 22 September 1849, at La Manta di Saluzzo, the home of his father, Francesco Rivoira (1814-75), the representative of an ancient family, originally from Savoy, but long settled in the neighbourhood of Saluzzo in Piedmont. It was the year of Charles Albert's brave but unsuccessful campaign and abdication, and of the accession of Victor Emmanuel. The father had been serving with the Sardinian army, and his son's birth took place in his absence.

Rivoira was accustomed to explain his interest in the constructional side of architecture by his inheritance, through his grandmother (Angela Riccati), of some of the scientific and architectural ability of the Riccati family, the most eminent member of which was the mathematician Jacopo Francesco Riccati (1676-1754).¹ He must have received the foundations of a sound education at the local Collegio, and he passed from thence to the University of Turin, where he took the course of engineering; and it should be remembered that the Italian 'ingegneria' includes the constructional side of architecture as well as engineering proper. He was barely eighteen when, in 1867, he obtained his first professional employment under the Order of SS. Maurice and Lazarus in superintending some work on the hospitals at Aosta and the Little St. Bernard. After two years of this he went to Sicily, apparently in the Government service under the Viceroy, General Medici, but no details have been preserved. The unification of Italy quickly followed, and on 20 September 1870 he entered Rome as a volunteer in the national army on the staff of General Cadorna. Henceforward Rome was to be his home. He entered the Government Department of Posts and Telegraphs, in which he was employed for many years, being at one time private secretary to the Director-General. It was from the opportunities afforded during those years, when his official duties took him into all parts of the country, that he gained the knowledge of the ancient and medieval antiquities of Italy, especially in the Provincia di Roma, where he superintended the inauguration and development of the telegraph system, which formed the foundation of his historical work. For, in spite of his scientific and technical training (to which he always felt he owed much), his interests and studies

¹ See *Encyclopaedia Britannica* (11th ed.), vol. xxiii.

were developing in the field of the history of art. It must be remembered that, though his University diploma was in engineering, his general education had laid a foundation of scholarship which was essential to his later researches. He once told the writer that in the first instance he was attracted to the subject of Italian painting, then entering on fresh developments under the auspices of Giovanni Morelli. But he found that the field was already crowded with workers, and he thought that he should be better employed in devoting himself to the problems connected with the evolution of church architecture in Europe from the end of the classical age to the appearance of the Gothic, or, as he always insisted on calling it, the Pointed style. To the development of this theme he increasingly devoted his time and energies. He early formed a theory, which was the foundation of all his work, that the Lombardic vaulted basilica (of which Sant' Ambrogio at Milan is the best-known example) on the one hand depended on the principles of construction discovered and practised by the architects of Imperial Rome, and on the other was itself the starting-point in an evolution of which the vaulted Gothic cathedral was the climax. This theory had next to be verified and expounded, and he devoted the rest of his life to the task. The foundations on which he was to build must be secure, and the real facts about the buildings concerned must be investigated anew, not merely restated on the authority of previous writers. In every case the precise statements and inferences of the documentary evidence must be ascertained, and interpreted in accordance with contemporary historical conditions ; and, what was still more important, the tangible evidence of the buildings themselves must be recorded, if possible by personal inspection and study ; if not, by means of reliable information and photographs. In order to carry out, so far as possible, this ideal of personal verification, he began a series of archaeological pilgrimages, interrupted only by periods of study and research at home. Released from the Government service, he went in 1899 through Dalmatia, and the next year visited Constantinople, Salonica, and Athens. In 1902 he travelled through Syria, Palestine, and Egypt ; in 1903 he saw southern Spain, in 1904 Tunisia, and in 1905 the great Romanesque churches of Germany. France and Great Britain had long been familiar to him, the latter even before his English marriage in 1884.

Meanwhile the book in which his results were to be given to the world was being written ; and in 1901 the first volume of *Le Origini dell' Architettura Lombarda* appeared. It was at once accepted as a work of importance, though the strong line it took in asserting the predominance of Roman and not Eastern influences in the architecture of what is called the Byzantine Age did not escape the criticism of the school of Strzygowski. The second volume was published in 1907, and as the edition of the complete work was limited and had become expensive, it was

quickly followed by a single volume with the same title, in which the material was condensed or recast. This was made the basis of the English translation (*Lombardic Architecture*) published in 1910. Parts of the book, however, were rewritten, and important additions were made, so that the two volumes really formed a new edition.

After 1910 he devoted himself to the preparation and execution of two works which were to be the complement of his main thesis. In accordance with his theory that Rome was the centre which dominated all the later architecture of the Mediterranean countries, it was necessary to trace the effects in the Arabic or Moslem world, and also in the outlying Christian countries, Armenia and Spain, which were in immediate contact with that world. This scheme led to a second visit to Constantinople in 1908, but the cholera epidemic, or rather the difficulties of travel which it involved, frustrated his intention of going on to Armenia. In 1910 he traversed the north of Spain, and in 1911 he saw Tripoli and Kairouan. The new book, *Architettura Musulmana*, appeared in May 1914, but owing to the war the English version (*Moslem Architecture*), which was nearly ready at the same time, had to be postponed till 1919. This time the Clarendon Press was his English publisher.

Rivoira had now followed out his thesis so far as he deemed necessary. He always insisted that his books were not complete histories of Lombardic or Moslem architecture, but only accounts of their origins, and of the buildings which were of crucial importance for that purpose. It remained to treat in the same way of that which formed the foundation of the whole structure, Roman architecture itself, and its development to the end of the Western Empire. In this case the greater part of the material dealt with was to be found in Rome and Italy, or was already familiar to him. The manuscript was finished when the author fell a victim to the influenza epidemic of 1919, and after an illness lasting but a few days died at Rome on 3 March at the age of sixty-nine.

Rivoira died with the consciousness that his work was practically finished, though it must be remembered that his final revision was lacking. The book as he left it had still to be brought out, and the duty was undertaken by his widow, the devoted companion of his travels and his studies, aided by the experience and knowledge of an old friend, Dr. Nogara, now Director of the Vatican Museum. *Architettura Romana* appeared in June 1921. In his lifetime Rivoira had expressed the wish that the writer, who had enjoyed his friendship and confidence for twenty years, should be the translator of this, as he had been of his previous works. The present version is therefore at once the fulfilment of a duty, and a tribute of respect and affection to the author's memory.

Rivoira had never sought for such official or academical honours as were

bestowed upon him. The decoration of the Commenda of the Corona d'Italia was conferred upon him by the King of Italy directly (*motu proprio*), very shortly after the appearance of the first volume of *Architettura Lombarda*. What he valued most was his election in 1905 to the premier learned society of Rome and Italy, the Reale Accademia dei Lincei (in the Section of History); and in 1908 the 'Origini' was awarded the 'Premio Reale' as the most important work of learning produced during the year. As far back as 1901 he had been made a member of the ancient Accademia di San Luca at Rome, and in 1916 he was elected to the Accademia Pontificia di Archeologia, the Papal representative of the old Lincei. He belonged to many Italian and foreign learned societies.

This is not the time or the place to attempt an estimate of the permanent value of Rivoira's contribution to the history of architecture. It is enough to say that he was one of the ablest champions of the, at present somewhat unpopular, cause of a Roman or Western origin as the principal factor in the history of Imperial and Christian art. It may be added, as characteristic of the man, that the very definite way in which he wrote about the views of the protagonist on the other side, Strzygowski, never interfered with their friendship and intercourse. Attention may be called to the disinterested tributes of two authorities in his own field, Count Robert de Lasteyrie and Professor Lethaby.¹ One of the great merits of his books is the precise and scientific statement of the actual facts about buildings, mostly based on repeated personal examination. This is well brought out in some words which Professor J. B. Bury has written in answer to a request for his impressions. 'What always struck me as the most salient characteristic of Rivoira was his independence of judgement. He tested everything for himself, and had no use for the *verba magistri*. I got this impression less, perhaps, from his books than from his conversation, in visiting, for instance, churches in Rome and rambling in the Campagna. He had made himself complete master of his subject, and always spoke with authority. One always felt that his knowledge was first-hand.' On clearness and precision of statement he had to rely for making his writing effective, for it was never his aim, nor, indeed, had he the literary gifts, to make it attractive or popular. Though by temperament he was not inclined to conciliation or compromise, he was not one of those authorities who think that it is due to their reputation to adhere obstinately to a position once taken up, even after it has been shown to be doubtful or untenable. Again and again, as I can testify, he modified or withdrew earlier statements when he found later that there was evidence against them.

¹ R. DE LASTEYRIE, *L'architecture religieuse en France à l'époque romane* (Paris, 1912), p. 272

(and cf. p. 259). W. R. LETHABY in *The Church of the Nativity at Bethlehem* (London, 1910), p. 29.

Rivoira had all the best features of his race—enthusiasm, integrity, intensity of conviction, a passion for hard work, devoted affection and friendship. He was an earnest patriot, and his patriotism was bound up with personal loyalty to the House of Savoy. But he had seen many lands and had made many friends among them, and he became, as time went on, a man of large views and wide sympathies. His ties with England, especially after the marriage which contributed so much to the happiness and success of his life, were very real. He would speak of it as ‘my second country’. This imperfect sketch may be concluded by some sentences in which an intimate friend whose name will command respect, Sir Charles Oman, has summed up his impressions of Rivoira’s character and attainments.

‘I had the pleasure and honour of seeing a good deal of Rivoira during the last twenty years of his active life, though we were both well into the shade of middle age when first we met. But he never showed any signs of failing energy or relaxing powers to the very end. He died, as he had lived, full to the brim of enthusiasm, and ready to tackle any new problem with youthful zeal. His architectural interests were as wide as they were inexhaustible, and no region was inaccessible to him when once he had discovered that there was some point of historical interest in it which might bear on his theories. He had visited not only all the Mediterranean lands, but tracts much further inland, like the centre of Asia Minor, Transjordan, and the Roman ruins on the edge of the Sahara. These were all remote, but supremely attractive from the grandeur of their monuments; but Rivoira had also penetrated to corners of Europe where travel was quite as uncomfortable, and the gleanings of architectural lore to be got from it much more problematical, such as the back valleys of the Asturias and Western Ireland. Indeed I know no region where his indefatigable energy had not carried him at one time or another. Who would have expected that an Italian savant would have thoroughly mastered all the remnants of Anglo-Saxon building in England, and have held high debate with local antiquaries on the Ruthwell Cross and the crypt of Repton? To hear of a possible source of new architectural lights was to him the same thing as to descend upon the spot where it lay without a moment’s lingering. I have known many enthusiasts, but never one so thoroughly and consistently enthusiastic. His busy and logical brain was always weaving some newly-discovered fact into his general theory of “Lombardic Architecture”.

‘I had the good fortune to take many a short excursion with him, sometimes in England and sometimes in Italy, and always came back from the little tour the richer, not only for facts discovered, but for theories developed. It is one of my deepest regrets that I was never able to accompany him in one of his longer journeys in remote regions, where he would have been as much at home as in Latium or in

Gloucestershire. Full of anecdote, with a keen interest in other history than that of architecture, with an ingenuity that swept away all difficulties that could possibly arise, he was a wonderful travelling companion. His loyal and fiery spirit and unconquerable energy would have taken him far in any line of life that he might have chosen. Architectural knowledge all round the world is the richer for the fact that he made architecture, and not some other line of scientific inquiry, his career. Wherever he might have turned himself he would have made admiring friends, for he was one of the most lovable as well as most energetic of mortal men.'

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ROMAN
ARCHITECTURE



I. THE END OF THE REPUBLIC AND THE REIGN OF AUGUSTUS

THE ways in which bricks or tiles or reticulate work (*opus reticulatum*) were used in building at Rome during the last age of the Republic and the reign of Augustus (29 B. C.—A. D. 14), are matters about which people's ideas are still far from clear. The same thing is true of the contemporary method of vaulting. Let us try to bring to bear upon this subject the light which is shed when the statements of ancient authorities are in agreement with the evidence of actual remains. In the course of our inquiry we shall have to call attention to two important elements in Roman construction under the Empire, viz. compound piers and buttress. A short account of the probable origin of the Roman Baths will also form part of our study.

The information we get from Vitruvius about brick or tile building is as follows. Vitruvius, we may note, flourished under Julius Caesar (100–44 B. C.) and Octavian, to the latter of whom he addressed his book, at a date later than the Senate's grant of the title of Augustus (29 B. C.), but before the death (11 B. C.) of the Emperor's sister, Octavia, whose influence had procured a pension for the author.¹ Bricks, he tells us, are made of clay mixed with straw.² In Italy the Etruscan walls of Arezzo were of brick. Bricks were used in Africa at Utica; in Further Spain at Maxilua and Callet (Calentum), the former being supposed to be, perhaps, a town in the Sierra Morena, while the latter probably is represented by the modern Cazalla-de-la-Sierra near Alanis.³ In Greece brickwork was to be seen at Athens, Patras, and Sparta; and in Asia Minor at Halicarnassus, Pitane, Sardis, and Tralles.⁴

To these places the Elder Pliny (23–79) adds Mevania (Bevagna) with its town walls, like those of Arezzo.⁵ There is no reason to doubt the existence of these walls, or to suppose that they are due to Pliny's imagination, for he must have seen them every time he passed along the Via Flaminia. But I have failed to find any traces of them in the modern Bevagna, where the oldest remains to be seen belong, apparently, to the second century A. D., and indicate a Roman

¹ VITRUVIUS, *De Architectura*, Praefatio. [Unless otherwise stated, the references to classical authors are taken from the editions of the Teubner series (*Bibliotheca Scriptorum Graecorum et Romanorum Teubneriana*).]

² VITRUVIUS, II, iii, 1.

³ W. SMITH, *Dictionary of Greek and Roman Geography*.

⁴ VITRUVIUS, II, iii, 4; viii, 9, 10.

⁵ PLINIUS, *Naturalis Historia*, xxxv, 173.

town, not one of Umbrian, or Umbro-Etruscan, or Umbro-Roman character. Thus the following remains must be ascribed to the time of Hadrian or the Antonines: the piece of reticulate about 26 metres (85 ft.) long in the wall on the south side; the shapeless ruins of the baths consisting of reticulate alternating with continuous bands of several courses of bricks 4 cm. (1½ in.) thick, with wide mortar joints; the remains of a temple built of coursed ashlar, with bands of brick as above; the traces of what is called an amphitheatre,¹ but which really seems to have been a theatre,² faced with brickwork of exactly the same character as that just described.

If we accept the view expressed by various writers, the latest being Choisy (1841-1909),³ all such bricks were unbaked, or only sun- or air-dried; for Vitruvius speaks of them as 'lateres', while he uses the terms 'lateres cocti', 'lateres testacei', for those which are kiln-baked or fired.⁴ This view is in need of some explanation and correction. Sometimes Vitruvius uses the terms 'lateres cocti' and 'lateres testacei' for kiln-baked bricks; for instance those of the walls of Babylon ascribed to the mythical Semiramis,⁵ which were set in hot bitumen.⁶ On other occasions when he mentions 'brickwork' or 'brick walls'⁷ he includes both crude and baked bricks. As a matter of fact, the ancient walls of Arezzo ('in Italia Arretio vetustum egregie factum murum') were built of kiln-baked bricks.

Secondly, by the term 'structura testacea' he means the use, not of bricks but of unflanged tiles, to which he obviously refers when he distinguishes the kiln-baked brick walls of houses within the city of Rome from those of crude brick in dwellings outside the city.⁸ As a matter of fact the existing specimens of late Republican and Augustan brick walling show that the 'structura testacea' consisted of tiles split in two, deprived of their flanges and with the outer edge ground down.

We said just now that the ancient walls of Arezzo mentioned by Vitruvius were of baked brick. They seem to have been those mentioned by Silius Italicus (about A.D. 25-100).⁹

'Poenus nunc occupet altos
Arreti muros.'

Recent excavations have brought to light on the north side of the city, near the Via della Catona, a portion 4.50 m. (about 15 ft.) thick, built on a shallow bed of clay which forms a perfectly level surface above the rock. The work appears to be pre-Sullan in date. It has lost its facing. In the surviving portion the bricks are not laid as regularly as they would be for a facing which must have existed originally, at any rate on the outer front, for otherwise the wall would not have shown the finished appearance noted by Vitruvius. A facing of this character was seen in his day by Giambattista Caporali of Perugia, who in 1536 wrote as follows: 'Arezzo has a wall made of bricks so carefully cut and dressed with the hammer and laid that the mortar joints between them can hardly be

¹ F. ALBERTI, *Notizie antiche e moderne riguardanti Bevagna città dell' Umbria*, pp. 8-II.

² BUCCOLINI, *Mevania. Notizie storiche e archeologiche*, pp. 45-7.

³ CHOISY, *Vitruve*, vol. i, pp. 7, 8.

⁴ VITRUVIUS, I, v, 8; II, iii, viii, 9; V, 10; VII, iv, 3; VIII, iii, 8.

⁵ VITRUVIUS, I, v, 8; VIII, iii, 8.

⁶ HERODOTUS, i, 178-80. DIO CASSIUS, lxxviii, 27.

⁷ VITRUVIUS, II, viii, 5 ff.

⁸ Op. cit., ibid.

⁹ SILIUS ITALICUS, *Punica*, v, 122, 123.

seen; and the bricks are still of such good quality that they have preserved a uniform tint.¹ These bricks are all of the same material, coral-red or wine-red in colour, and the firing is fair, and occasionally excellent. Their size varies from $41 \times 27 \times 14$ cm. ($16 \times 10\frac{1}{2} \times 5\frac{1}{2}$ in.) to $27 \times 26 \times 9$ cm. ($10\frac{1}{2} \times 10\frac{1}{4} \times 3\frac{1}{2}$ in.).² They resemble other Etruscan brick-fragments of the same character, 12 cm. ($4\frac{3}{4}$ in.) thick and 22 or 25 cm. ($8\frac{3}{4}$ or 10 in.) broad, lately unearthed at Perugia and preserved in the office of the Inspector of Ancient Monuments for Umbria.³ From this we may infer that the normal type of Etruscan kiln-baked bricks was the 'sesquipedal', i. e. one and a half Roman feet long: in other words, about 41 cm. (16 in.) long, 27 to 25 cm. ($10\frac{1}{2}$ to 10 in.) broad, and from 14 to 12 cm. ($5\frac{1}{2}$ to $4\frac{3}{4}$ in.) thick (fig. 1).

The remarkable thickness of Etruscan bricks, which must have been the same as that of Roman ones, is paralleled by the earliest examples from Egypt,⁴ and occasionally those from Crete of the Mycenaean or pre-Mycenaean age, which vary in thickness from 9 to 12 cm. ($3\frac{1}{2}$ to $4\frac{3}{4}$ in.).⁵ The oldest bricks from Chaldaea are from 5 to 10 cm. (2 to 4 in.) thick.⁶

The walls of Arezzo, which were already an antiquity in the time of Vitruvius, prove that there was no need for the Romans to come into contact with Asia, as Choisy imagines,⁷ in order to realize the advantage of kiln-baked bricks: they had plenty of examples close at hand in Italy.

However that may be, the only bricks used at Rome in the time of Vitruvius must have been unbaked ones. The broken, unflanged tiles clearly took the place of baked bricks: at any rate that is what we learn from the existing remains; and Choisy is wrong when he confuses such tiles with kiln-baked bricks.⁸ Crude bricks were only used outside the city boundaries, and the walls so built were protected from damage by rain by a layer of tiles some foot and a half thick, which also formed a coping.⁹ Under such conditions one can understand why specimens are not found in ancient ruins: they have been disintegrated by rain, crushed by pressure, and human agency has done the rest.

Within the city the use of crude brick for houses was forbidden, and they were constructed of worked stone, concrete, and tiles; in other words the 'structura testacea'.¹⁰ The latter was also used outside the inhabited area, apparently, judging from the specimens which remain, as an internal facing.

Augustus's demolitions must have been very extensive, if he was able to boast

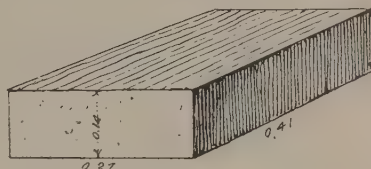


Fig. 1. Etruscan brick

¹ CAPORALI, *Vetruvio in volgar lingua rapportato*, fol. 58.

² [More of the wall has been discovered since. The indications suggest that it dates from the beginning of the third century B. C. L. PERNIER in *Notizie degli scavi*, vol. xvii (1920), pp. 167 ff.]

³ [Notizie degli scavi, vol. xvii (1920), p. 188.]

⁴ PERROT, CHIEPZ, *History of Art in Ancient Egypt*, vol. ii, p. 53.

⁵ R. Accademia dei Lincei, *Monumenti Antichi*, vol. xiv, cols. 374, 382, PERNIER, *Scavi della Missione italiana a Phaestos*, 1902-1903.

The Annual of the British School at Athens, vol. vii (1900-1901), pp. 121-49, HOGARTH, *Excavations at Zakro, Crete*. University of Pennsylvania, *Transactions of the Department of Archaeology*, vol. i, pp. 19, 34, 35, BOYD, *Report of the American Exploration Society's Excavations at Gournia, Crete*, 1901-1903.

⁶ PERROT, CHIEPZ, *History of Art in Chaldaea and Assyria*, vol. i, p. 117.

⁷ *Histoire de l'Architecture*, vol. i, pp. 520, 521.

⁸ *Ibid.*, p. 520.

⁹ VITRUVIUS, II, viii, 18.

¹⁰ *Ibid.*

that he found Rome of brick and left it of marble.¹ Very few examples survive of pre-Augustan and Augustan 'structura testacea' without bonding material, composed that is of broken, unflanged tiles, with the outer edge ground smooth on a porous stone such as peperino, and applied, not throughout, but only to parts of a building. They are five in number, four of which may be seen to-day



Fig. 2. Columbarium of Pomponius Hylas
(From *Dissertazioni della Pont. Accademia Rom. di Arch.*, xi, tav. 3)

in the tombs of Caecilia Metella and Gaius Cestius, the walls of the Great Rostra, and fragments of the walls of the 'Domus Publica'. The fifth, the tomb of Sulpicius Platorinus, is represented only by fragments put together in the Terme Museum.²

Some would add the Columbarium of Pomponius Hylas near the Porta Latina; but the date is not certain, as it may be as late as Tiberius (A. D. 14-37).³ In this Colum-

¹ Suetonius, *Augustus*, 28.

² *American Journal of Archaeology*, 2nd S., 1912, p. 396, VAN DEMAN, *Methods of Determining the Date of Roman Concrete Monuments*.

³ *Dissertazioni della Pontificia Accademia Romana di Archeologia*, vol. xi, pp. 263-313, tavv. i-viii, CAMPANA, *Due sepolcri romani del secolo di Augusto*. *Corpus inscr. lat.*, vol. vi,

barium (a miniature basilica in plan) attention may be called to the 'aediculae' or tabernacles projecting from the walls, surmounted in some cases by broken pediments; for though similar structures had been represented before this in Pompeian paintings, they had not been carried out in actual buildings (fig. 2).



Fig. 3. Tomb of Caecilia Metella

Let us turn now to the five examples.

I. The tomb of Caecilia Metella, wife of Crassus, on the Via Appia Antica (fig. 3), is dated somewhat before 53 B. C., and ascribed either to the triumvir M. Licinius Crassus (d. 53 B. C.),¹ or, on account of the style of ornament, to his son M. Licinius

p. 956. LANCIANI, *The Ruins and Excavations of Ancient Rome*, pp. 329, 330, 597. *Papers of the British School at Rome*, vol. v (1910), pp. 463-

71, pls. xxxviii-xlvii, ASHBY and NEWTON, *The Columbarium of Pomponius Hylas*.

¹ CANINA, *Gli edifizii di Roma antica*, vol. iii,

Crassus, who was consul in the years 30 and 14 B. C.¹ It consists of a high base, each side measuring 22.30 m. (about 73 ft.), which owing to the site being on a slope stands out prominently towards the valley. Upon this rises a high circular structure originally terminated by a cone. The core is formed of cast concrete containing pieces of lava (*selce*) mixed with a few lumps of travertine, the mass being levelled at intervals by a shallow bed of lime. The exterior is faced with converging blocks of travertine, a much better weather-stone than peperino. Marble was used

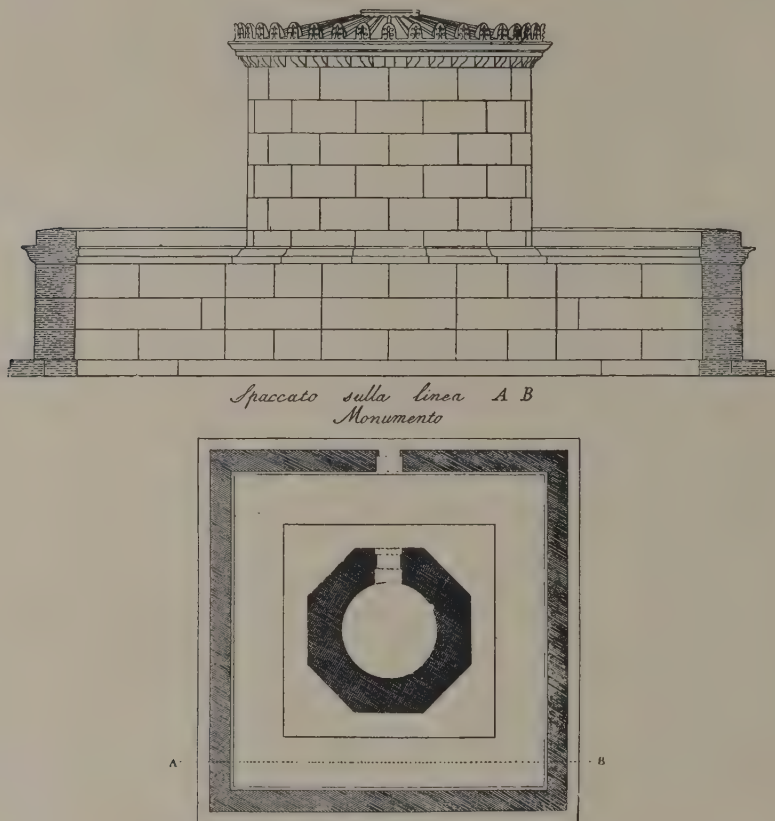


Fig. 4. Bovillae. Tomb of the Julian family (From TAMBRONI, tav. ii)

in the decorative parts and for the facing of the conical summit. Within, the two chambers and the passages leading to them are lined with fine brickwork without any courses of tiles.² The construction can be seen in the very high ovoidal cupola of the upper chamber.

An older example of this Campanian type of cupola existed in the so-called Sanctuary of the Julian family at Bovillae (fig. 4), barbarously destroyed in 1846.

p. 139; iv, tavv. cclxxii, cclxxiii. *Via Appia dalla Porta Capena a Boville*, vol. i, pp. 87, 88; ii, tavv. xv, xvi. NIBBY, *Roma nell'anno 1838. Parte antica*, pp. 550-6.

¹ TOMASSETTI, *La Campagna romana antica*,

medioevale e moderna, vol. ii, pp. 60-70.

² *Bullettino della Commissione Archeologica Comunale di Roma*, vol. xli (1913), pp. 4-14, MUÑOZ, *Restauri e nuove indagini su alcuni monumenti della Via Appia*.

A view of it, however, was preserved by Labruzzi (1748–1817)¹ and soon after it was described by Tambroni in 1823² and by Nibby (1792–1839),³ who thought that it seemed to be a tomb perhaps intended for the Julian family, or else the ‘Sacrarium gentis Iuliae’ mentioned by Tacitus.⁴ It was built of rectangular blocks of peperino clamped with iron. According to Tambroni the interior was wholly circular, 4.45 m. (15 ft.) in diameter, and 6 m. (20 ft.) high, covered with a hemispherical vault closed by a stone of conical shape, while according to Nibby the interior space had a funnel-shaped vault which seemed to have been closed originally by a keystone. Apparently it was a case of a chamber with a conical roof like that in the tomb of Caecilia Metella. The exterior, Nibby says, consisted of a square base on which stood an octagonal plinth supporting the main structure,



Fig. 5. Cervetri. Etruscan tumulus-tomb

which was also octagonal, but circular in the upper part. Tambroni, on the other hand, describes it as having a square podium supporting an octagonal base on which the circular part stood. The monument, whatever its purpose, was evidently of sepulchral form, and certainly not of the time of Tiberius (A. D. 14–37), as the section of the vault, and also the material used belong, at the latest, to the days of Sulla (136–78 B. C.) rather than to the age of the emperor.

After these preliminaries, let us see whether we can find the date which best fits the tomb of Metella. The Etruscan predecessors of the Roman architects,

¹ LABRUZZI, *Via Appia illustrata ab Urbe Roma ad Capuam*, vol. iii, fol. 14 (Library of the Academy of St. Luke, Rome: Biblioteca Sarti). [Reproduced by DR. ASHBY in *Mélanges de l'École Française de Rome*, vol. xxiii (1903), p. 395.]

² *Atti dell' Accademia Romana di Archeologia, Dissertazioni*, vol. iii, pp. 124, 163–5, tav. ii,

TAMBRONI, *Intorno alcuni edifici dell' antica città di Boville*.

³ NIBBY, *Analisi storico-topografico-antiquaria della carta de' dintorni di Roma*, vol. i, pp. 311, 312.

⁴ TACITUS, *Annales*, ii, 41.

unlike the Greeks, whose funeral monuments were simply artificial cones or mounds of earth raised over tombs usually made of stone or marble, from early times had constructed tumulus-tombs with a low circular wall of dry stone supporting a conical mound of soil (fig. 5). In rare instances the wall stood on a square stepped base, as in the tomb at Cervetri (fig. 6) noticed by Canina (1793-1856).¹ To judge from existing examples, the Romans at first followed the old Etruscan pattern, keeping the conical mound of soil or constructing it of masonry, and either raising the retaining wall to some height, or else keeping it low. It was only at the close of the last century B. C. that they began to build the base high. The monuments which illustrate this are the following.



Fig. 6. Cervetri. Tumulus-tomb with base
(From CANINA, *Etruria Marittima*)

(1) A tomb known as 'il Torrione' at the first kilometre from Rome on the Via Prenestina, and supposed to be that of Titus Quintus Atta, a writer of national Roman comedy (*fabulae togatae*).² It has preserved its high substructure, over 33 m. (108 ft.) in diameter, which starts with a low plinth above the foundations in the virgin tufa, and retains a few of the quadrangular blocks of peperino (a stone which suffers from frost) with which it was cased. Within is a cruciform chamber, the arms being unequal, with a barrel vault and facing (as also in the entrance passage) of squared blocks of peperino. Above this rose a mound of earth with a curb 2 m. (6½ ft.) thick. The structure suggests a date earlier than that of tombs with reticulate or travertine facing on the roads round Rome, and Atta may well have been its occupant.

¹ *L'antica Etruria marittima compresa nella dizione Pontificia*, vol. i, p. 197, tav. lxx.

² CANINA, *Edifici*, vol. v, pp. 86-8; vi,

tav. cv. [*Papers of the British School at Rome*, vol. i (1902), p. 152.]

(2) A nameless tomb on the left side of the Via Appia Antica coming from Rome, between the X and XI milestones, and described by Canina.¹ The fairly high (about 5 m. = 16½ ft.) original base is formed of a core of concrete consisting of lava chippings with a large admixture of lime and pozzolana, faced with good reticulate of wedge-shaped prisms also of lava. Owing to the fact that the elongated vault of the chamber rises above the cornice of the circular structure, the tumulus (reached by two flights of stairs) is of masonry instead of soil. Within, the cruciform mortuary chamber built of large squared blocks of peperino has barrel vaults over the four equal arms and a cloister-vault (*padiglione*)² of the same volcanic stone over the square crossing, and was not, as Canina erroneously supposed, closed by a slab forming a sort of keystone, making a cup or hull-shaped vault. The cloister-vault was not formed by parts of barrel vaults, as represented by Labruzzi,³ but by four wall-surfaces mutually supporting one another (figs. 7 and 8).

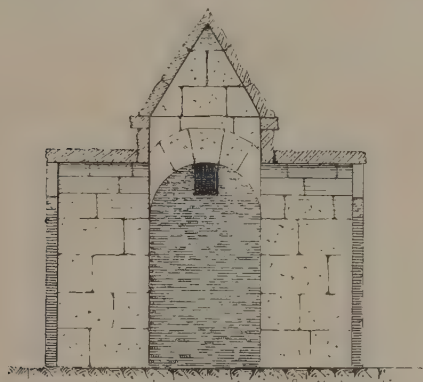


Fig. 7. Via Appia. Unidentified tomb. Section

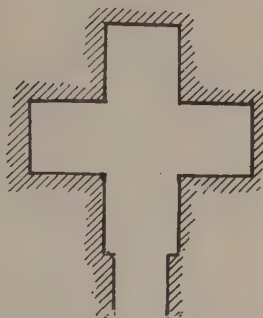


Fig. 8. Plan of the same tomb

The date of the building must be later than the introduction of Roman cloister-vaults in the time of Sulla; or, to be more exact, later than the erection of the Mausoleum of Augustus, on account of the superiority of the reticulate as compared with that of the Mausoleum. About the third century, a time, Nibby says, when the era (beginning with the dictatorship of Sulla) of the majority of the surviving monuments on the Appian and other roads round Rome seems to come to an end,⁴ the tomb was used again, passing apparently from individual to collective ownership. On this occasion the actual entrance towards the Via Appia was made, the tomb originally seeming to have been without one, as there are no traces at the usual points, viz. on the face away from the road or at the sides. Moreover, the three unbroken walls of the cella, left rough at first, were faced with brick; and on the side of the drum facing the road was added a row

¹ *Edifici*, vol. v, p. 42; vi, tav. l. *Via Appia*, vol. i, pp. 194, 195; ii, tav. xlvii.

² [The nearest equivalent for the Italian 'volta a padiglione' (literally 'pavilion or tent-vault') is the cloister-vault or square dome, described as 'composed of four parts of equal barrel vaults, but is just the reverse of the

groined, the internal angles being re-entrant'. R. STURGIS, *Dictionary of Architecture*, vol. iii, col. 951. See also below, figs. 85-7.]

³ *Via Appia*, vol. ii, tav. xxxi (Collection of Dr. T. Ashby, Director of the British School at Rome).

⁴ NIBBY, *Dintorni di Roma*, vol. iii, p. 535.

of niches, the brickwork of which (like that within) is contemporary with that of the Mausoleum of Gallienus (253–268) at the ninth milestone of the road.

Before leaving this nameless sepulchre, I may recall another on the same road, which has an identical cloister-vault, viz. the tomb supposed to be that of the Servilii¹ (fig. 9). It stands against one side of the portico of the mausoleum of Romulus, son of Maxentius. Inside a square mass of concrete made of lumps of tufa thrown in at random with occasional layers of lime, the cruciform mortuary chamber, measuring about 5.40 × 5.40 m. (about 18 ft. square), is formed with its central space covered by a cloister-vault made by four planes of concrete in which the lumps of tufa were laid by hand on a flat frame. An annular passage with a rough barrel vault goes round it, lighted by two small windows, each of which corresponds to a loophole in the aforesaid mass. The jambs of the two arched entrances to the passage and the chamber are formed of broken tiles ground down on the outer face. Above this substructure rise the projecting courses of the ruined 'tholus' or dome. The archaic character of the cloister-vault, the absence of brickwork, and the smoothness of the concrete lead one to date the tomb late in the reign of Augustus.

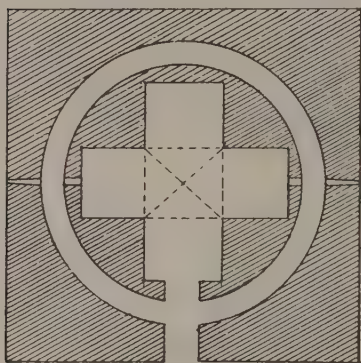


Fig. 9. Plan of the 'Tomb of the Servilii' on the Via Appia

Huelsen's conjecture that this is the tomb mentioned by Sangallo near San Sebastiano is untenable.² The tomb (now destroyed) illustrated by the great architect was a large circular structure standing on steps, with sixteen recesses round the exterior of its single story. In front were two flights of steps, and the chamber, with eight niches round its walls, was lighted by a round opening or eye at the top.

(3) The mausoleum erected for himself by Augustus in the Campus Martius at Rome (28 B.C.)³ (fig. 10). The existing remains and the brief account by Strabo (first cent. B.C.)⁴ show that it consisted of a lofty drum with an annular corridor 88 m. (286 ft.) in diameter, regularly formed at the base by the mass of tufa concrete, above which is a broad band or zone of reticulate of tufa blocks, not all of uniform size or perfectly even face, and therefore producing sometimes rather wavy lines. This had a decorative outer facing of white marble. The exterior of the drum proper with shallow recesses, made for structural reasons, was also faced with marble, and supported a mound of earth planted with evergreen trees. This was the first sepulchral monument in Rome of known date to be clothed in marble. Previously, marble linings were confined to private houses, and Mamurra, one of Julius Caesar's generals, was the first to introduce them.⁵

(4) The tomb of Cotta or the 'Casale Rotondo' on the Via Appia Antica outside Rome (fig. 11). Some have thought that its structure and decoration show three distinct periods;⁶ but really there appear to have been only two,

¹ Vatican Library, MS. Latin 3439, fol. 44. CANINA, *Edifici*, vol. vi, tav. xvii. *Via Appia*, vol. ii, tav. x. BARTOLI, *Gli antichi sepolcri*, tavv. 30, 31.

² HUELSEN, *Il libro di Giuliano da Sangallo*,

p. 56, fol. 39.

³ SUETONIUS, *Augustus*, 100.

⁴ STRABO, v, 3.

⁵ PLINIUS, *H. N.*, xxxvi, 48.

⁶ CANINA, *Via Appia*, vol. i, pp. 144–56;

and its history will have been as follows. Originally it consisted of a lofty cylindrical structure about 27 m. (88 ft.) in diameter, not set on a base, supporting a mound of greenery. The core is concrete made of lava chippings mixed with a certain proportion of travertine (evidently coming from the working of the facings and the bondings which fastened them to the core), a few lumps of tufa, and rarely fragments of tiles. Before it was dismantled it had a facing of travertine with a set-off at the base. The cornice was of peperino. It was erected by M. Valerius Messala Corvinus, consul in 31 B.C., the protégé of Augustus, and is the oldest surviving dated Roman tomb of concrete faced with blocks of limestone

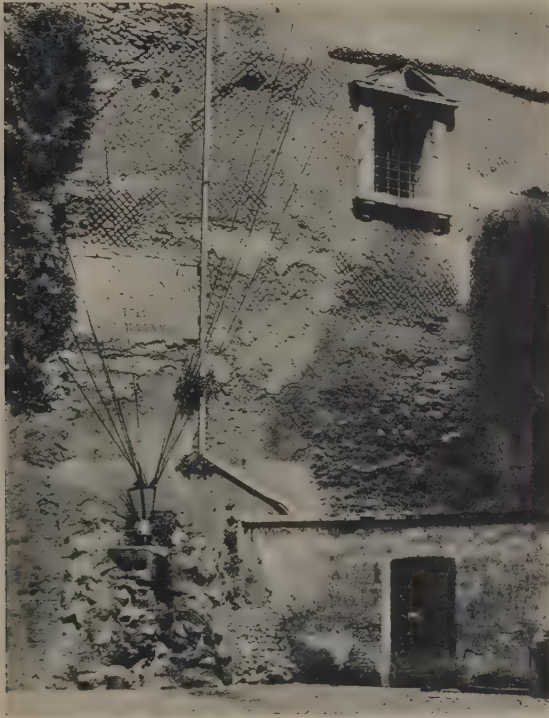


Fig. 10. Remains of the masonry of the Mausoleum of Augustus

from Tivoli. His son Valerius Messalinus Cotta, governor of Dalmatia and Pannonia (A.D. 6), the subject of Ovid's (43 B.C.—A.D. 16) eulogies,¹ whose cognomen can be read on the surviving fragment of the dedicatory tablet, remodelled it, adding sculptured marble decorations, portions of which remain, and replacing the evergreen mound by an imbricated cone of marble. Martial makes allusion to it.²

(5) The two tombs of archaic type at the V milestone of the Appia Antica—the so-called tombs of the Horatii³ (fig. 12). The mound of earth rests on a low

Edifici, vol. v, pp. 36, 37; vi, tavv. xxxix–xli.
TOMASSETTI, *La Campagna Romana*, vol. ii,
pp. 101–4.

¹ OVID, *Ex Ponto*, IV, xvi.

² MARTIAL, *Epigrammata*, X, ii.

³ CANINA, *Edifici*, vol. v, p. 33; vi, tav. xxxiv.
Via Appia, vol. i, pp. 125–7; ii, tav. xxi.

retaining wall, not set on a base, which is about 2.50 m. ($8\frac{1}{2}$ ft.) high above the level of the paving of the road, and composed almost entirely of lava chippings irregularly laid in copious mortar. The facing of the northern one is of peperino, that of the southern of travertine. In both, especially the former, there are remains of the ornamental cornice. The result is that the first tomb must be dated in the Republican period, and the second at the beginning of the Empire.

(6) The large tomb standing near the two last, with a small cylindrical tower on the summit, being one of the five assigned to the Horatii and Curiatii. Its drum is of some height, rising about 4 m. (13 ft.) above the paving of the road,



Fig. 11. Via Appia. Tomb of Cotta or 'Casale Rotondo'

is built on the flint rock, and supports a mound of earth. The core is formed of annular layers of concrete corresponding to the courses of radiating travertine blocks with which it was faced. The outer facing was of white marble slabs clamped together. The monument has been dated about the end of the Republic or the beginning of the Empire,¹ but I think it must be later than the Mausoleum of Augustus on account of the employment of marble instead of ordinary stone, and about contemporary with the pyramid of Gaius Cestius on account of the regular layers of concrete in the core.

Tested then by this series of monuments, the tomb of Metella must be dated in the time of M. Licinius Crassus, son of the triumvir, and well on in the reign of Augustus. It is the prototype of the surviving and dated tumulus-tombs of masonry set on a high base, whether in the west or the east. The Eastern world

¹ *Notizie degli scavi*, 1906, pp. 338-44, PINZA, *Scavi al V miglio dell' antica Via Appia*.

learnt this form of monument from the Romans, a fact which has been noticed by others.¹

Next in order comes the tomb of the Plautii at the Ponte Lucano on the Via Tiburtina, built for M. Plautius Silvanus, consul in 2 B.C.² (fig. 13). It consists of a square base, now buried by the deposits of the Anio, on which stands a lofty drum divided into two zones by a string-course. It is faced with travertine. In the base is the entrance to a cruciform barrel-vaulted chamber. Above this Canina places a second chamber of large size with a conical vault ;³ but this is mere conjecture,



Fig. 12. Via Appia. 'Tombs of the Horatii and Curiatii'

for in the time of Piranesi this part of the tomb had already been replaced by a structure which he thought, but wrongly, belonged to the time when the tomb was converted into a fortress,⁴ which took place in 1465 under Pope Paul II (1464-1471), whose arms are there.

A drawing by Giuliano da Sangallo (1452-1516), supposed to have been made between 1504 and 1507,⁵ gives the true and interesting plan of the cruciform

¹ *Monumenti antichi*, vol. xxiii, pp. 39-47. PARIBENI, ROMANELLI, *Studi e ricerche archeologiche nell'Anatolia meridionale; un mausoleo romano ad Adalia*.

² *Chronica Minora* (Teubner Series), vol. i, p. 466. *Fasti Consulares*. [CLINTON, *Fasti Hellenici*, iii, p. 262.]

³ CANINA, *Edifizi*, vol. v, pp. 109-11; vi, tavv. cxxi, cxxii.

⁴ PIRANESI, *Antichità romane*, vol. iii, tav. iii.

⁵ HUELSEN, *Il libro di Giuliano da Sangallo*, fol. 41^v, pp. 58 and xxviii. [For Giuliano's dates see pp. xlix ff.]

chamber, with an annular barrel-vaulted passage running round it, lighted by four windows made in the fifteenth century, and with a spherical vault over the central space (fig. 14).

The Roman taste for funeral monuments of the tumulus type lasted till the third century, as is shown by the nameless one (the so-called tomb of Alexander Severus) at Monte del Grano on the Via Tuscolana.¹ Its circular chamber (with



Fig. 13. Tomb of the Plautii at Ponte Lucano

annular passage) 11.80 m. (40 ft.) in diameter, has walls faced with brick, and a hemispherical vault, the concrete of which is not supported by ribs but is set on flat tiles. Hence the only inference that we can draw is that the work must be dated between the Flavian age (69-96), when, as we shall see at the proper time, per-

¹ CANINA, *Edificii*, vol. iii, p. 145; iv, tav. cclxxxi.

manent centering began to be used, and the reign of Alexander Severus (222-235) when ribbed domes were introduced. But the well-known sarcophagus found in it, now in the Capitoline Museum, is ascribed to the first quarter of the third century;¹ so this must also be the date of the tomb itself.

II. No authority gives the exact situation of the 'Domus Publica', but it is highly probable that it was on the north-east slope of the Palatine. Some remains in the precincts of the House of the Vestals, ascribed to the Republican period² and having brick facing, may have belonged to it.

III. We have no information about the site of the Great or Imperial Rostra erected after the murder of Caesar (44 B.C.); nevertheless it is certain that they extended from the Arch of Septimius Severus to the Basilica Julia. It is now thought that they were the work, not of Augustus (in 29 or 20 B.C.), but of the *Triumvirs*, perhaps specially of Antonius.³

Among the ruins which occupy almost the whole of the western side of the Forum from the Basilica Julia to the Arch of Severus, the rectangular wall belongs to these rostra, and the use of brick facing may be observed in it.⁴

I may note here that the row of arched chambers forming the so-called Rostra of Caesar consists in its original parts, which I examined during the excavation, of *opus incertum*, not *reticulatum*, and must go back to the Republican period, between the time of Sulla and that of Pompeius.

IV. The tomb of Sulpicius Platorinus, 'triumvir monetalis' in 18 B.C., when unearthed near the Farnesina, showed brick facing in the interior.⁵

V. The tomb of Gaius Cestius is a pyramid, of which each side is over 22 m. (73 ft.) long at the base, while the vertical height is 27 m. (88 ft.). Piranesi (1720-1778) says that the core was made of regular courses of bits of lava chippings set in lime and pozzolana, with, at intervals, layers of marble chippings, carefully and regularly laid flat⁶ (fig. 15)—a detail which should be noticed, inasmuch as this is the first case of a dated Roman faced monument in which the concrete core was made level at intervals instead of being poured in indiscriminately all through. Previously such levelling layers were absent or were formed by a mere bed of lime. The mortuary chamber, which measures 5.90 × 4.10 m. (19½ ft. × 13½ ft.), is faced with brick up to the impost of the semicircular vault.

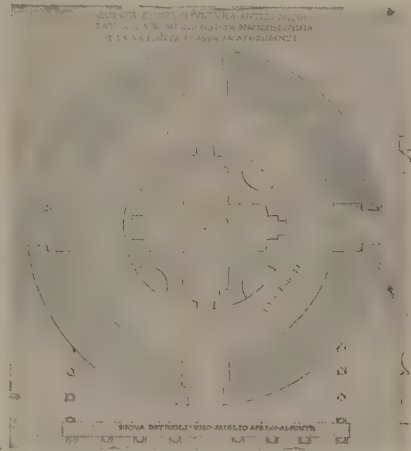


Fig. 14. Plan of the tomb of the Plautii. From a drawing by Sangallo

¹ STUART-JONES, *A Catalogue of the Ancient Sculptures preserved in the Municipal Collections of Rome*, pp. 78-81. STRONG, *Roman Sculpture*, p. 316.

² DE RUGGIERO, *Il Foro Romano*, pp. 260-2. *Bullettino della Commissione Archeologica Comunale*, vol. xxxi (1903), pp. 79, 80, VAGLIERI, *Gli scavi recenti nel Foro Romano*.

³ DE RUGGIERO, *op. cit.*, pp. 359-81.

⁴ *Atti del Congresso internazionale di Scienze storiche* (1893), vol. v, pp. 556-62. G. BONI, *Foro Romano*.

⁵ *Notizie degli scavi*, 1880, pp. 127-38, LANCIANI, *Roma. Bollettino d'Arte*, 1911, pp. 365-72, PARIBENI, BERRETTI, *Ricostruzione del Sepolcro di C. Sulpicio Platorino*.

⁶ PIRANESI, *Antichità Romane*, vol. iii, tavv. xliii, xlv.

Nibby dates the monument about 35 B.C.,¹ but the external facing of Luna marble fixes it after the erection of the Mausoleum of Augustus, but earlier than 12 B.C., as Cestius was dead before that year.²

I may note here that in the dead city of Pompeii broken tiles were used in building from early times, both with and without their flanges, dressed with the hammer, and then ground down on the edge intended to be shown. For instance, in the Stabian Baths (second and first centuries B.C.) the practice may be ob-

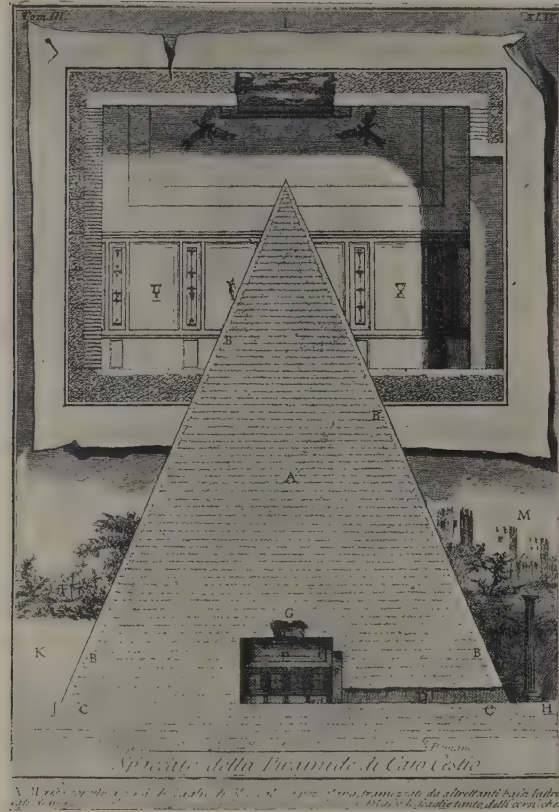


Fig. 15. Pyramid of Cestius
(From PIRANESI, *Antichità Romane*)

served in openings of various kinds, and in the transverse arches of the barrel vaults springing from pilasters in the Apodyterium.

And now to return to the point from which we started. The restricted use of kiln-baked bricks extended to Greece, and Pausanias (second century) mentions only two buildings of this material: the shrine of the Mysian Demeter between Mycenae and Argos, and the Philippeum at Olympia.³ On the other hand, sun- and air-dried bricks were much used. The same is true of Crete, where, both

¹ NIBBY, *Roma Antica*, pp. 534-40.

² *Corpus Inscriptionum Latinarum*, vol. vi, p. 301.

³ PAUSANIAS, ii, 18; v, 20.

in the Mycenaean age (1600–1100 B.C.)¹ and in the pre-Mycenaean, bricks in the shape of parallelepipeds made of a mixture of clay and straw, and laid without mortar, were usually dried in one of the above ways; and if in some cases the surface appears to have been fire-baked, this was probably the result of a conflagration. But, by way of exception, in internal walls they were slightly fire-baked,² the process, according to Professor Halbherr, consisting simply in warming or airing the bricks at a fire in order to dry them more thoroughly. Afterwards in Crete, as in Greece, solid walls of unbaked brick were raised on a broad stone base, and the cohesion of the structure was secured by vertical beams.³

This holds good also for Egypt, where from remote times crude bricks, measuring $38 \times 18 \times 12$ cm. ($15 \times 7 \times 4\frac{3}{4}$ in.) were in use, made of Nile mud mixed with triturated straw.⁴ The same, again, is true of Lydia, for, until the contrary is proved, it is a mere conjecture that kiln-baked bricks were used there as far back as the reign of Croesus (about 591–546 B.C.).⁵

Roman bricks were rectangular, one foot (0.296 m.) broad, one and a half (0.444 m.) long: 'longum sesquipede, latum pede' (fig. 16). Vitruvius does not give the thickness.⁶ They were what the Greeks described as Lydian bricks ('quod graece Lydium appellatur'). The bricks commonly used by the Greeks were, on the contrary, square and of two kinds: the *pentadoron* and the *tetradoron*.



Fig. 16. Roman bricks

The *pentadoron* measured five palms (or one foot of 0.309 m. and a quarter), apparently of the type of the kiln-baked bricks, measuring $37 \times 37 \times 9$ cm. ($14\frac{1}{2} \times 14\frac{1}{2} \times 3\frac{1}{2}$ in.), used without mortar in a large sarcophagus unearthed in the necropolis of Rosarno, the ancient Medma, and dated between the middle of the fifth and the middle of the fourth century before Christ.⁷ The *tetradoron* measured four palms (say a foot). The thickness is not mentioned. The first were used in public buildings, the second in private.

Besides these whole ones, bricks broken in half were also used, and about them there has been much controversy, which still continues. In the case of Roman bricks, some have fancied that they were sections of cubes (*corpi di dado*)

¹ BURY, *A History of Greece to the Death of Alexander the Great*, pp. 20, 21.

² *The Annual of the British School at Athens*, vol. vii (1900–1901), pp. 121–49, HOGARTH, *Excavations at Zakro, Crete*; vol. xi (1904–1905), pp. 1–26, EVANS, *The Palace at Knossos and its Dependencies*. *Monumenti antichi*, vol. xiv, cols. 374, 407, 482, PERNIER, *Scavi della missione italiana a Phaestos, 1902–1903*. *University of Pennsylvania*; *Transactions of the Department of Archaeology*, vol. i, pp. 19, 34, 35, BOYD, *Report of the American Exploration Society's Excavations at Gournia, Crete, 1901–1903*.

³ *Annuario della R. Scuola Archeologica di*

Atene e delle Missioni Italiane in Oriente, vol. i, p. 81, PERNIER, *Templi arcaici sulla Patela di Prinias*.

⁴ PERROT, CHAPIEZ, *History of Art in Ancient Egypt*, vol. ii, p. 53.

⁵ PERROT, CHAPIEZ, *History of Art in Phrygia, Lydia, &c.*, p. 279.

⁶ VITRUVIUS, II, iii, 3. [The passage refers to sun-dried bricks. Dr. Ashby informs me that bricks at Rome were always square, not oblong.]

⁷ *Notizie degli scavi*, vol. xiv (1917), pp. 37–67, ORSI, *Rosarno, Campagna del 1914, sepolcro 35*.

1 ft. long, $\frac{1}{2}$ ft. broad, a palm thick, which divided in two made half bricks.¹ Others have supposed that the half bricks were of triangular shape resulting from two diagonal cross cuts in a whole brick while still soft, thus making four triangular bricks out of a rectangular one.² The objection to this, as has been pointed out,³ is the language of Vitruvius,⁴ who when speaking of triangular bricks ought to have called them 'lateres trigones', not 'semilateres'. Others have argued that they were of square shape, the dimensions corresponding to a half of the *pentadoron* and *tetradoron*.⁵ Marini,⁶ again, held that it was a case of whole bricks cut in two lengthwise, a view which seems to be shared by Prestel⁷ and Morgan.⁸ Choisy,⁹ on the contrary, and others¹⁰ with him, believe that half bricks were made by cutting whole ones in two transversely, and measured 1 ft. by $\frac{3}{4}$ ft. A longitudinal cut would have made them liable to split on account of their excessive length. I, for my part, think that half bricks produced by longitudinal cutting would not be so liable to split if they were carefully laid; and they would be better adapted to produce the fine walling described in Vitruvius.

The way in which these bricks and half bricks were used was to lay them in rows with alternate courses, one of the first sort, the other of the second, placing them so that the middle of each brick came above a vertical joint. The expression 'medii lateres' of Vitruvius¹¹ must be understood (as Marini remarks¹²) as if he had written 'media laterum'.

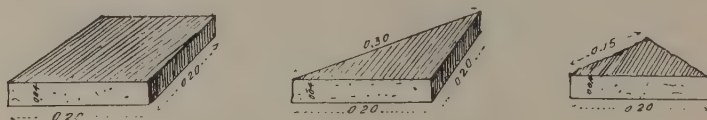


Fig. 17. Small Roman bricks

The Romans also used exceptionally, in hypocausts, *laterculi besales*, that is to say, small bricks of 8 in. or $\frac{2}{3}$ of a foot (0.197 m.)¹³ (fig. 17).

With regard to *opus reticulatum* it is known that in the time of Vitruvius it was preferred to the ancient *opus incertum*, although it was liable to disintegration from the absence of level beds and solid joints.¹⁴ This statement at first sight may be thought rash in view of—not to speak of other important monuments—the dismantled Mausoleum erected for himself by Augustus in the Campus Martius, and the amphitheatre at Casinum (built by Ummidia Quadratilla, daughter of Gaius Ummidius Durmius Quadratus, legatus under Tiberius and Claudius, proconsul under Nero¹⁵), which are standing proofs to the contrary. The fact may

¹ CAPORALI, *Vitruvio in volgar lingua rapportato*, fols. 50, 51. LUCIO DURANTINO, M. L. *Vitruvio Pollione de Architectura*, traducto di Latino in Vulgare, fol. 14.

² LEON BATTISTA ALBERTI, *De re aedificatoria*, lib. ii, 10. BARBARO, M. *Vitruvii Pollionis de Architectura cum commentariis*, pp. 53, 54.

³ ORTIZ Y SANZ, *Los diez libros de Architectura de M. Vitruvio Polion*, p. 33.

⁴ VITRUVIUS, II, iii, 4.

⁵ VIVIANI, TURZI, *L'architettura di Vitruvio*, vol. i, pp. 22, 23.

⁶ A. MARINI, *Vitruvii de architectura*, vol. i, p. 79; vol. iv, tav. ix.

⁷ Zehn Bücher über Architektur des Marcus Vitruvius Pollio, tav. iii.

⁸ MORGAN, WARREN, *Vitruvius*, pp. 43-4.

⁹ CHOISY, *Vitruve*, vol. i, p. 9.

¹⁰ Ch. PERRAULT, *Les dix livres d'Architecture de Vitruve*, p. 35.

¹¹ VITRUVIUS, II, iii, 4.

¹² A. MARINI, op. cit., ibid.

¹³ VITRUVIUS, V, x, 2.

¹⁴ VITRUVIUS, II, viii, 1. SUETONIUS, *Augustus*, 100. STRABO, v, 3.

¹⁵ BARTOLINI, *Viaggio da Napoli alle Forche Caudine ed a Benevento e di ritorno a Caserta*. [C. I. L., x, 5182, 5183. DESSAU, *Inscriptiones Latinae Selectae*, 972, 5628.]

be due to the quality and perfection of the mortar used (we know that the mortars of that period were of such solidity that in some cases they were harder than natural rock), owing to which the facings and the concrete core form, as it were, a uniform mass. But there is no doubt that non-horizontal courses, and the laying of the stone prisms in rows, but not so that one always came above the joint between two others, must have been elements of weakness in many cases, if in process of time it became necessary to insert horizontal bonding-courses in work of this kind in order to strengthen it. In any case, reticulate was not a mere caprice or an irrational kind of fashion, as one writer has described it.¹

In the Augustan age both *opus reticulatum* (the 'opera ammandorlata' or lozenge-work, as Galiani called it²) and *incertum* were used as facing to a core of concrete without horizontal bands or through-stones. To give it strength Vitruvius suggests that red squared stone should be used for the filling-in, or broken tiles, or even ordinary lava; and that the faces should be tied together with iron clamps fixed with lead: but I have never yet come across an example of this method in ancient work.

With regard to filled-in walls, the Roman writer observes that the Greeks not only constructed their *emplecton* with layers of stones on level beds, but made them solid all through by means of stones which fastened alternately each face to the core (i.e. stones rather longer than ordinary, sufficing to bind together two sections of the wall), and then strengthened the whole by setting from point to point 'diatoni', that is to say, through-stones equal to the thickness of the wall and showing on both faces, and thus binding together all three sections of the wall.³

I may remark here that the use by the Greeks of *emplecton* formed of earth or masonry goes back a long way. For instance, at Athens the existing walls of the 'Dipylum' or Double Gate, and of the city wall running from it to the so-called Sacred Gate and the Hill of St. Athanasius, all ascribed to the period from Themistocles (about 528-470 B.C.) and Pericles (about 494-424 B.C.) to the Macedonian age, were built with facings of blocks of dressed stone and filling-in of undressed blocks, or stones, or earth.⁴ And still earlier, the outer wall of the palace at Knossos in Crete, belonging to the pre-Mycenean age, was constructed with an internal and external facing of chalk blocks, separated by a core of earth and stones held together by wooden cross ties, with swallow-tail ends.⁵ I also note that the ruins of the temple of Zeus at Labranda (fig. 18) provide an example of walls with faces tied together by 'diatoni' or through-stones. Here the walls

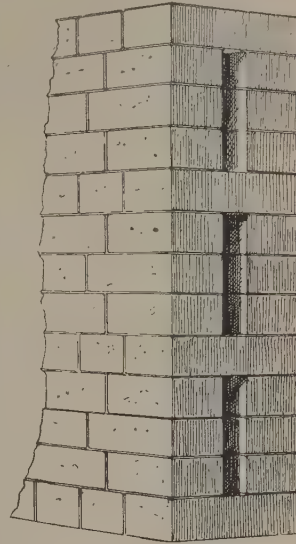


Fig. 18. Labranda. Through-stones in the temple of Zeus (From LE BAS, REINACH, *Voyage archéologique*, &c.)

¹ C. HERSCHEL, *The Two Books on the Water Supply of the City of Rome* by S. J. Frontinus (2nd ed., London, 1913), p. 157.

² B. GALIANI, *L'Architettura di M. Vitruvio Pollione* (2nd ed., Siena, 1790), p. 67.

³ VITRUVIUS, II, viii, 7.

⁴ FRAZER, *Pausanias, Description of Greece*,

vol. ii, pp. 42-5.

⁵ *The Annual of the British School at Athens*, vol. vii (1900-1901), pp. 3, 4, fig. 1, EVANS, *The Palace of Knossos*; vol. xi (1904-1905), pp. 21-3, fig. 2, EVANS, *The Palace of Knossos and its Dependencies*.

faced with coursed blocks are tied transversely between every three courses by through-stones: the space between was left empty as the wall was not thick.¹



Fig. 19. Palestrina. Temple of Fortune

To judge by existing remains, *opus reticulatum* originated from *incertum* as an improvement on it, just as the latter came from polygonal work.

With regard to *opus reticulatum* and *incertum*, which are confused by some

¹ LE BAS, REINACH, *Voyage archéologique en Grèce et en Asie Mineure*, fig. 65.

writers in certain cases, it will be convenient to settle the following definitions, so as to avoid misunderstandings.

Opus reticulatum is that in which the blocks or prisms are uniform in size, with squared base cut more or less regularly according as the stone is soft or hard, set in diagonal continuous courses so as to look like a net stretched tight, the lines of which represent the beds of mortar, and the intervals the prisms.

Opus incertum, even when carefully constructed, like that of the time of Sulla, sometimes described as 'pseudo-reticulate', is made of irregularly shaped blocks, with faces which may be square, rectangular, pentagonal, triangular, or rounded, set anyhow and not after a regular pattern settled beforehand.



Fig. 20. Rome. Porticus Aemilia

Reticulate did not make its appearance till after the time of Sulla, as is proved by the important remains of the temple of Fortuna Primigenia at Palestrina (Praeneste), where all the *opus incertum* masonry clearly belongs to one time only, that of Sulla, who destroyed the city on its surrender, and enlarged, or rather rebuilt,¹ the temple of Fortune on its ruins (fig. 19).²

These remains are important. In the first place the quality of the stone prisms used in the facings and their mortar reveal the progress which this kind of masonry had made since the erection of the Porticus Aemilia at Rome, and also its rapid approximation to reticulate. Of this 'porticus', built in 193 B.C. by Aemilius Lepidus and Paulus Aemilius, but restored and improved by Fulvius Flaccus and

¹ GRAEVIUS, *Thesaurus Antiquitatum*, vol. viii, p. 4. *Praenestes Antiquae*, lib. i, xv.

² NIBBY, *Dintorni di Roma*, vol. ii, p. 481. *Il Tempio della Fortuna Prenestina*.

Postumius Albinus in 174 B.C.,¹ there survive great pieces of wall about 1.45 m. (nearly 5 ft.) thick, faced with *incertum* and filled in with lumps of tufa embedded in masses of lime—an indispensable requisite for the solidity of this kind of work (figs. 20, 21). It has been suggested that the remains of this portico—one of the earliest examples of faced concrete in Roman work—are really those of the Emporium of the Imperial age;² but the archaic method of construction is fatal to this idea.



Fig. 21. Rome. Porticus Aemilia

In the next place the vaulting gives a clear idea of the method employed by the Romans at that date in similar structures. In the two wide passages flanking the hemicycle of the upper group of temple buildings may be seen the semicircular vault of *opus incertum* like the walls, constructed of radiating blocks of local limestone set on a thick layer of mortar still retaining the impression of the centering-boards, and the filling-in above. The frontal arch has voussoirs of peperino tailing off into the wall so as to strengthen the vault itself at a point of great importance. In the floors of these passages are remains of Sulla's³ 'lithostroton',

¹ LIVY, XXXV, 10; xli, 27.

² JORDAN, HUELSEN, *Topographie der Stadt Rom im Alterthum*, vol. i³, p. 173.

³ Pontificia Accademia Romana d'Archeo-

logia; *Dissertazioni*, vol. x, ser. 2^a, part 1^a, pp. 149-90, MARUCCHI, *Il grande mosaico prenestino*, &c.

mentioned by Pliny¹ as one of the earliest instances of this kind of marble pavement.

The practice of constructing the intrados of a barrel vault with small radiating stones already occurs in the Porticus Aemilia described above, where the very scanty remains of the vaulting show courses of oblong pieces of tufa set radiating in lime, and supporting the filling-in above. The openings of the portico also have arches of just the same construction.

Contemporary with the restoration of the temple at Palestrina must be the erection of the temple of Hercules at Tivoli (illustrated by Canina).² The ruins of this extensive building, especially the imposing remains of the outer portico overhanging the Anio (originally in two stories, the upper of which has disappeared) and also those of the inner (which, again, had two stories, but now only one), indicate the Sullan period by the facings of fine *opus incertum* extended to the mural columns of concrete, in the same way as is done at Palestrina.

The same period is revealed in the passage for the high road through the substructions of the two porticoes, where the *opus incertum* of the walls originally extended over the barrel vault, but in the course of time has come away owing to the infiltration of water. This work was carried out by the commissioners (*quatuorviri*) L. Octavius Vitulus and C. Rustius Flavius on a decree of the Senate, as is proved by an inscription, now in the Vatican Gallery of Inscriptions, which has been reproduced in lithographic facsimile by Ritschl among others of similar palaeographical characteristics belonging, approximately, to the time of Sulla.³ The same date may be assigned to the so-called temple of Vesta in the ancient citadel of Tivoli, which, it is agreed, is certainly earlier than Augustus, and has been dated 72 B.C.⁴ To the Sullan period, again, belongs the idea of arcades in stories for buildings set against a hill, illustrated by the temple of Fortune at Praeneste, and the Tabularium of the Capitol at Rome.



Fig. 22. Ostia. From the Walls of Sulla

The age of the ruthless dictator opened a new epoch in Roman building, and illustrates the principle that great social and political changes are generally followed by an architectural revival.

Any one who studies on the spot the remains of Sulla's three most important works, viz. the temple of Fortune at Palestrina, the temple of Hercules at Tivoli, and the Tabularium on the Capitol at Rome, will see that they seem to have been designed and carried out by one and the same Roman state architect, and that they exhibit three novelties in construction, viz. the quadripartite ungroined cloister-vault, the lunette barrel vault, and cruciform piers from which spring four visible vault-arches. He will then realize that the Sullan age, which saw so much town-reconstruction after the destruction caused in Italy by the Social

¹ *H. N.*, xxxvi, 189.

² *Edifici*, vol. v, pp. 113-26; vi, tavv. cxxiv-cxxxii.

³ RITSCHL, *Priscae latinitatis monumenta epigraphica*, col. 68, tav. 75 k. [DESSAU, 5388.]

⁴ CANINA, *Edifici*, vol. v, pp. 126-30; vi, tavv. cxxxiii-cxxxvii. VALADIER, *Raccolta delle più antiche fabbriche di Roma antica; Tempio detto della Sibilla in Tivoli*, pp. 3, 4.

War, forms, with the connecting link of the public and private buildings of Aemilius Scaurus, Sulla's son-in-law (whose lavish expenditure roused the indignation of Pliny),¹ an introduction to the grandiose conceptions of the days of Caesar and Augustus, with their aim of transforming the modest 'Urbs' into the capital of the world.

I will conclude this enumeration of the buildings of the Sullan age by calling attention to what appears to be a piece of the Sullan walls of Ostia, which had been taken and sacked by Marius.² It is faced with careful *opus incertum* (figs. 22, 23³).

From the Sullan *opus incertum* to *reticulatum* the transition is short; and when we find the latter predominant in the Augustan age we may believe that it originated in the last years of Caesar (100-44 B.C.). In fact it was used in the internal

walls of Pompey's theatre at Rome, dedicated in 55 B.C.,⁴ the first theatre to be built of solid masonry at Rome.

In the cellars of the 'Istituto Tata Giovanni' in the Piazza del Biscione I have observed considerable remains of the barrel-vaulted substructions of the 'cavea' or pit, in which the walls are faced with tufa reticulate, identical with that in the Mausoleum of Augustus. The core consists of tufa rubble; the vaults are made of the same material, the pieces being set at random. The walls and vaults retain traces of their thick skin of plaster; and brickwork is entirely absent. Construction of the same kind is to be seen in the substructures of the 'cavea' of the theatre of Marcellus (44-11 or 13 B.C.).⁵



Fig. 23. Ostia. Podium of the four Shrines

With the theatres of Pompey and Marcellus, and the Mausoleum of Augustus, may be classed the villa of the Empress Livia 'ad Saxa Rubra' at the IX milestone from Rome on the Via Flaminia, on the farm of Prima Porta, which exhibits just the same careless reticulate. Of a later date is the house of Germanicus (15 B.C.—19 A.D.) on the Palatine, which is supposed to have been erected by the father or grandfather of the Emperor Tiberius (14-37);⁶ but the advanced reticulate in the vestibule, the atrium, and the four rooms opening from it, which is almost exactly similar

¹ H. N., xxxvi, 113.

² *Monumenti antichi*, vol. xxiii, pp. 442-83. PARIBENI, *I quattro tempietti di Ostia*. *Bullettino Comunale di Roma*, xxxix (1911), pp. 232, 233. VAGLIERI, *Monumenti repubblicani di Ostia*.

³ [Fig. 23 was intended by the author to illustrate another (probably) of Sulla's restorations at Ostia—the podium of the four shrines (the 'quattro tempietti' of the preceding note) with irregular reticulate.]

⁴ DIO CASSIUS, xxxix, 38. PIRANESI, *Il Campo Marzio dell' antica Roma*, tav. xviii. CANINA, *Edifici*, vol. iii, pp. 7-18; iv, tavv. cliii-clviii.

⁵ CANINA, *op. cit.*, vol. iii, pp. 18-20; iv, tavv. clx-clxiii. NIBBY, *Roma nell' a. 1838*. *Parte Antica*, pp. 593-600.

⁶ VISCONTI, LANCIANI, *Guida del Palatino*, pp. 121-8.

to that of the well-known apsidal room of uncertain use in the Gardens of Maecenas (c. 67 B.C.—A.D. 8) on the Esquiline,¹ shows that its date is not earlier than the time of Tiberius Claudius Nero, the first husband of Livia Drusilla (56 B.C.—A.D. 29). In other words, it is later than the Mausoleum of Augustus.

The walls of all these buildings, when in their original state, are faced with rather irregular reticulate, and have a filling of tufa rubble. The jambs of the openings have quoins of oblong tufa blocks (fig. 24). This method of consolidation was traditional with the Romans, and examples of it may be found in the Porticus

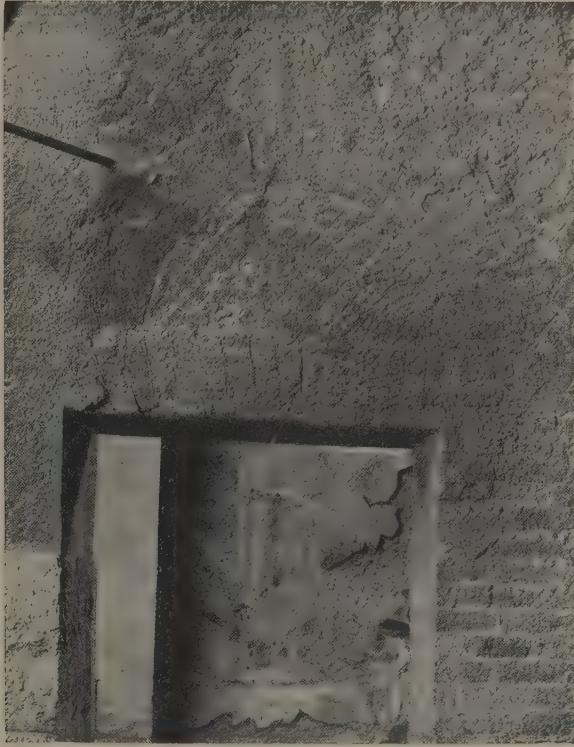


Fig. 24. House of Germanicus on the Palatine

Aemilia at Rome, and in the temple of Fortune at Palestrina. The openings themselves are covered by straight arches of voussoirs with relieving arches above. These straight arches show that in the time of Vitruvius the architraves of openings in private buildings were not made exclusively of wood, as would appear from his statement.² Perhaps beams were used in ordinary houses, as at Pompeii; while straight arches were employed for the mansions of the great, at least in the lower stories.

Early examples at Rome of similar relieving arches are to be found in the Tabularium, ascribed to Lutatius Catulus (78 B.C.); some shops built against the

¹ *Bulletino della Commissione Archeologica Comunale*, ii (1874), pp. 137-71, VESPIGNANI, VISCONTI, *Antica sala da recitazioni, ovvero*

Auditorio scoperto fra le ruine degli Orti mecenaziani sull' Esquilino.

² VITRUVIUS, VI, xi, 2.



Fig. 25. Rome. Forum of Augustus

inside of the enclosure wall of the Forum of Caesar, erected in 54 B.C. ;¹ the Forum of Augustus (fig. 25) (42-2 B.C.) ;² and the remains of the theatre of Pompey.³

This form of relief was also practised by the Etruscans, combined with lunettes,

¹ Suetonius, *Julius*, 26.

² Suetonius, *Augustus*, 28.

³ Canina, *Edifici*, vol. iv, tav. clvii.

as in the ruined tomb known as the 'Tanella' or 'Grotto of Pythagoras' at Cortona (fig. 26). This is a circular structure 8 m. (26 ft.) in diameter, of large squared blocks set without mortar. It contains a chamber 2.50 × 2 m. ($8\frac{1}{4} \times 6\frac{1}{2}$ ft.) originally covered by a barrel vault formed by five monolith voussoirs carefully worked on five faces (and not left rough, or with only four voussoirs, as shown in some illustrations¹) resting on two monolith lunettes, the one in front serving to relieve the architrave of the doorway. The archaic character of this vault suggests that the tomb is earlier than the fourth century B. C.; for to that century is assigned the tomb of the Tlesnei with its semicircular vault of dressed stones, radiating like voussoirs, discovered near Chianciano and now set up in the garden



Fig. 26. Cortona. Grotto of Pythagoras

of the Archaeological Museum at Florence.² To the fourth century may also belong the so-called tomb 'del Granduca' near Chiusi, in which the barrel vault of radiating travertine blocks forms almost a horse-shoe arch, and the architrave of the door is relieved by a lunette made of two large blocks. In Sardinia, too, a lunette is introduced above the entrances to tombs such as the rock-cut one at Molafà near Sassari³ (fig. 27).

The form of relief which we are discussing had its origin, apparently, in the triangular relieving spaces over the lintels of the entrances into the nuraghi and

¹ MARTHA, *L'Art Etrusque*, fig. 119. ABEKEN, *Mittelitalien*, tav. v. DURM, *Handbuch der Architektur; Die Baustile, Die Baukunst der Etrusker*, vol. ii (2nd ed.), p. 51.

² MILANI, *Il R. Museo Archeologico di*

Firenze, vol. i, p. 288.

³ *Papers of the British School at Rome*, vol. v (1910), pp. 87-137, MACKENZIE, *The Dolmens, &c., of Sardinia*.

sacred wells of Sardinia,¹ and the similar ones surmounting the doorways of Greek tombs such as the so-called Treasury of Atreus, and another close to the Lion Gate at Mycenae.²

A house about contemporary with that of Germanicus has been recently excavated under the 'lararium' of the palace of Domitian on the Palatine. It has doors with straight and relieving arches, and the barrel vaults are formed of concrete poured straight on to the centering boards.

On the Palatine the houses with reticulate wall-facing, which were cut through by the works of Nero and Domitian, and have been unearthed of late years, may all be assigned to the Augustan age. Outside Rome an early dated example of reticulate is the theatre of Ostia erected in 27 B.C. by Agrippa (63-12 B.C.),³ enlarged under Hadrian, and finally almost rebuilt by Septimius Severus and Caracalla⁴ (fig. 28). In these ruins the remains of Agrippa's work have walls with poor reticulate facing and tufa quoins, filled in with lumps of the same material mixed with fragments of pottery jars, all thrown in anyhow, lime being freely added so as to consolidate the whole.

Buildings with reticulate walls at Rome (but not those on the Via Appia) were at first usually of tufa with jamb-stones or quoins of oblong blocks only in the jambs of the openings, and occasionally at the outer salient angles of walls. And with the reticulate went (supposing that mosaic was not used) flooring of *opus spicatum*, a form invented at Tibur⁵ (Tivoli), consisting of small bricks set herring-bone fashion.

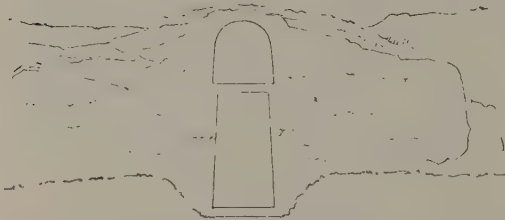


Fig. 27. Molafà (Sardinia). Tomb in the rock
(From *Papers of the British School at Rome*, v, 124)

to have been known in the city of Rome during the Augustan age. Thus, though in the drawing of the cruciform Columbarium belonging to the freedmen of the Empress Livia (56 B.C.—A.D. 29) on the Via Appia Antica, reproduced in fig. 29, baked bricks or tiles are to be seen in the walls, these were used promiscuously and not as bonding material.⁶ The same thing is true of the Columbarium of the freedmen of the Marcelli in the Vigna Codini to the left of the Via Appia Antica, constructed at the end of the Augustan age, that is to say about the year 10.⁷ It has reticulate with arches of tufa.

Outside Latium brick or tile quoins are found in wall-faces from the first century B.C. onwards. An example is the covered-in theatre at Pompeii, erected in the same year as the amphitheatre, on the foundation of Sulla's colony.⁸ Here

¹ *Monumenti antichi*, vol. xxiii, col. 346, TARAMELLI, *Il tempio nuragico ed i monumenti primitivi di S. Vittoria di Serri* (Cagliari).

² PERROT, CHAPIEZ, *History of Art in Primitive Greece*, vol. 1, pp. 352 ff.

³ *Notizie degli scavi*, 1880, pp. 469-78, LANCIANI, *Via Ostiense*; 1881, pp. 109-18, LANCIANI, *Ostia*.

⁴ *Pontificia Accademia Romana di Archeologia; Dissertazioni*, vol. x (ser. 2, part 2),

pp. 278, 279, PASCHETTO, *Ostia*.

⁵ VITRUVIUS, VII, i, 4.

⁶ PIRANESI, *Le antichità Romane*, vol. iii, tavv. xxi-xxvi. FICORONI, *La Bolla d'oro, &c.*, pp. 64-7. BIANCHINI, *Camera ed iscrizioni sepolcrali de' liberti, servi, ed ufficiali della Casa di Augusto*, figs. i-iv.

⁷ *C. I. L.*, vol. vi, pp. 908-10.

⁸ FIORELLI, *Descrizione di Pompei*, pp. 352-4.

we find facings of the good *opus incertum* peculiar to the Sullan period, with quoins of broken tiles (fig. 30). I may also mention the inner visible face of the Augustan town-walls of Turin (c. 28 B.C.) where the coursed pebble-work has quoins and bands of brick.

Before leaving the Augustan age I should like to call attention to the following points.

(1) From Vitruvius we gather that of the principal feature of architecture, that which co-operates to produce the greatest effects, viz. the vault, the only kind in use, having a straight base, was the semicircular. About this, however, some explanation is necessary.

That such was the usual form is proved by the remains. It was only by way of exception, as we shall see when we come to the Golden House and the Coliseum, that we find quadripartite ungroined or cloister vaults, as well as groined vaulting. Perhaps this is why they are not mentioned by Vitruvius.

The barrel vaults which he does describe were of four kinds: those made of masonry; those made with furring strips and reeds; those hung from metal hooks; and those that are double.¹ The hanging vault was constructed by preparing a series of iron hoops or arcs on every pair of which was set a layer of unflanged tiles. The hoops in their turn were hung from the beams above by iron hooks set as close together as possible. On the upper side of the vault the joints were daubed with clay mixed with hair; on the under side they were stopped with pounded tile mixed with lime, and then coated with polished stucco or lime. The double vault is recommended for the hot room (*calidarium*) of baths, so that the moisture from the heat may evaporate in the intervening space and not reach the rafters of the roof, which it might affect injuriously.

It may be mentioned here that the semicircular vault with its underside formed of radiating tiles was known in the time of Augustus, as appears from the tomb of the freedmen of Livia mentioned above.

Although the barrel vault originated in the East,² the Romans must have got it from the Etruscans, to whom in Italy the credit for the development of the keyed vault and of the arch belongs.³ These developments, it seems, were independent of what had been previously achieved by older peoples, for we know that the Chaldeans had before this turned arches above the walls of underground channels, and the entrances to cities, palaces, and temples; while the Assyrians had sprung arches not only from continuous walls but also from piers.⁴



Fig. 28. Ostia. Reticulate in the theatre of Agrippa

¹ VITRUVIUS, V, x, 3; VII, iii, 1. [I am indebted to Professor M. H. Morgan's translation (p. 158) for most of the rendering which follows.]

² PERROT, CHIPIEZ, *History of Art in Ancient Egypt*, vol. i, p. 110; ii, p. 77; *History of Art in*

Chaldaea and Assyria, vol. i, p. 144.

³ *Atti della R. Accademia dei Lincei*, vol. xiii (ser. 5), pp. 3-29, CULTRERA, *Bettona, tomba a camera Etrusco-Romana*.

⁴ PERROT, CHIPIEZ, *History of Art in Chaldaea and Assyria*, vol. i, pp. 132, 221.



Fig. 29. Via Appia. Columbarium of the freedmen of Livia
(From BIANCHINI, fig. IV)



Fig. 30. Pompeii. Covered theatre

The Etruscans as far back as the sixth century B.C. had constructed a vault with a wedge-shaped keystone for the tomb at Orvieto ('Tomba di Crocefisso del Tufo') now in the garden of the Archaeological Museum at Florence¹ (fig. 31), and quite early had used stone keyed barrel vaults as arches for city gates: for instance, the 'Porta all' Arco' at Volterra, the 'Porta di Giove' or 'Porta Augustea' and the 'Porta di Bove' at Faleri, and the 'Arco di Augusto' at Perugia. Later they had improved their appearance by making them of monolith stones or of hewn blocks, in the case of tomb-chambers such as: the tomb of San Manno near Perugia, where the middle vault is made of blocks while the two lateral ones are of monoliths; the 'Deposito del Granduca' and the 'Deposito di Vigna Grande' at Chiusi; the tomb of the Tlesnei also at Chiusi, but now in the garden of the Archaeological Museum at Florence; and the tomb at Bettona.



Fig. 31. Orvieto. Tomba di Crocefisso del Tufo
(Garden of the Archaeological Museum, Florence)

The Romans afterwards gave it a form of their own, by developments and improvements. Thus we have already found it in concrete with the underside formed of small radial blocks, or else of *opus incertum*, in the Porticus Aemilia (174 B.C.) and the temples of Hercules at Tivoli and of Fortune at Palestrina belonging to the Sullan period. And presently we shall see it reaching development and perfection.

(2) From Vitruvius we also learn that the Romans had only one kind of vault with curvilinear base, continuous with the wall from which it springs, viz. the hemispherical, and that it was employed for circular peripteral temples as well as for the 'laconicum' of baths.² The suggestion for concrete roofing of this kind had come to the Romans from the false domes of the Etruscans, who as far back as the eighth-seventh century B.C. had used such for tombs like that from Casal Marittimo, now in the garden of the Archaeological Museum at Florence (fig. 32). The false cupola of this tomb is constructed of eleven rings of tufa

¹ MILANI, *Il R. Museo Archeologico di Firenze*, vol. i, p. 292.

² VITRUVIUS, IV, viii, 3; V, x, 5.

blocks projecting one beyond the other from the drum, and resting on one another, and closed at the top by a round slab or closed eye.

The ovoidal cupola, which was certainly known to the Romans, as their neighbours the Etruscans and Campanians had made use of it, never took root with them, and Vitruvius mentions it among the obsolete kinds. A short account of it will be found at the end of this volume (pp. 253 ff.).



Fig. 32.. Volterra. Tomb from Casal Marittimo
(Garden of the Archaeological Museum, Florence)

(3) In this period we may note the presence of two features of Imperial Roman construction, viz. the pier with engaged column on the exterior of Roman theatres and amphitheatres, and the buttress.

Examples of the former are to be seen in the theatre of Marcellus begun by Julius Caesar in 44¹ and finished by Augustus in 11 or 13 B.C.² But its origin goes back to the third century B.C., when it makes its appearance in the Circus Fla-

¹ DIO CASSIUS, xliii, 49.

² DIO CASSIUS, liv, 26. *Nuova Antologia*,

1 April 1906, ERSILIA CAETANI LOVATELLI, *Il Teatro di Marcellus*.

minius (221 B.C.).¹ Next we find it in the theatre of Pompeius, dedicated in 55 B.C.,² where a temple of Venus Victrix or of Victory formed a projection from the extreme point of the 'cavea' ³ (fig. 33). This arrangement, recalling that of some tombs in Sardinia, e.g. the one at Muraguada near Bauladu ⁴ (fig. 34), at a later date provided a suggestion for the architect of the mausoleum of the Anicii, erected in honour of Sextus Anicius Petronius Probus, city prefect in 368 and consul in 371, by his wife Proba,⁵ and destroyed by Pope Nicholas V (1447-1455). This building seems to have been the origin of the medieval idea of the Lady Chapel at the end of a church.⁶

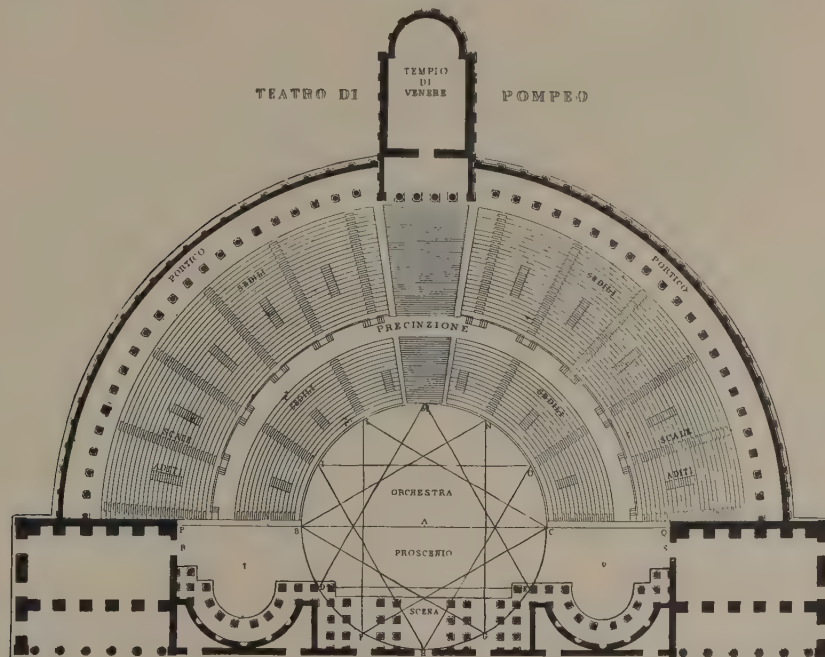


Fig. 33. Plan of the theatre of Pompeius
(From CANINA, *Architettura*)

The pier with engaged column was the source of the cruciform pier, in the form either of simple piers or of piers with engaged columns, designed to carry visible arches and vaults. They have nothing in common with clusters of pillars used from early times in the East in order to provide multiplied imposts.

The earliest examples of these engaged columns are to be found in the Tabularium on the Capitol at Rome, and in the outer portico of the temple of Hercules

¹ LIVY, xx epit. CANINA, *Edifici*, vol. iii, pp. 48-50; iv, tav. clxxxvi. CAETANI LOVATELLI, *Passeggiata nella Roma antica. Il Circo Flaminio*, pp. 109-28.

² DIO CASSIUS, xxxix, 38.

³ CANINA, *Edifici*, vol. iii, pp. 7-18; iv, tavv. cliii, cliv. PLINY, *H. N.*, viii, 20.

⁴ *Papers of the British School at Rome*, vol. v

(1910), MACKENZIE, *The Dolmens, &c., of Sardinia*, p. 120.

⁵ BARONIUS, *Annales eccl.*, vol. vi, pp. 178-80. BONANNI, *Templi Vaticani Historia*, pp. 30, 31. DE ROSSI, *I. C. R.*, vol. ii, pp. 348, 349. *C. I. L.*, vol. vi, p. 389.

⁶ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 9, 10, 196.

at Tivoli, where there are cruciform piers on which are turned three or even four visible arches carrying both cross and barrel vaults.

The second feature, viz. the buttress, was applied on a grand scale all round the exterior of the theatre at Aosta, which is of the same date as the foundation of the city.¹ Those still preserved on the south side, slightly battering as they rise, are about 22 m. (73 ft.) high and 1×0.75 m. (3 ft. 3 in. $\times$ 2 ft. 6 in.) thick (fig. 35).

In the East from early times similar adjuncts had been adopted to enable walls to be built thinner, or for decorative reasons. But it was the Romans who gave them their various forms, and developed the constructive and static ideas involved in them.² The arch and the vault, of which the Romans were so fond, have a thrust; and equilibrium is produced by the counter-thrust.

Vitruvius does not allude to external buttresses intended to strengthen walls while diminishing their thickness, or else to reinforce them at the points where there is an internal thrust. He merely says that in building piers with arches

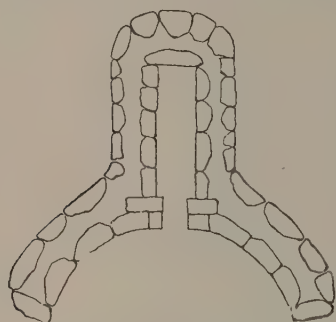


Fig. 34. Tomb at Muraguada (Sardinia) (From *Papers of the British School at Rome*, v, 121)

made of radiating voussoirs, the outermost piers should be more bulky than the others so that they may be strong enough to resist the thrust of the voussoirs, which owing to the load they have to carry press towards the centre with a thrust against the imposts. And he only speaks of strengthening substructures in the foundations of buildings by means of hollow triangular spurs penetrating the mass of the underground structure, and kept in place by external stepped buttresses: a method which could be extended, with the necessary modifications, to the substructures of fortifications.³

(4) In the same period we may note the prototype of the vaulted basilica, with apse, nave, aisles, and narthex.

Not long ago there was excavated at Rome near the Porta Maggiore an underground building, with nave and aisles separated by six rectangular piers. The nave ends in a semicircular apse turned towards the east, and there is a vestibule at the west (fig. 36). The irregularity of every part of the structure suggests that it was carried out by excavation and centering in the virgin soil.⁴ The building, which is all of a piece, is of lava concrete, and thus forms a single coherent mass. The arches are depressed. Nave and aisles have barrel vaults, those of the aisles being stilted in order to raise them to the same height as that over the nave. The vestibule has an elongated barrel vault, pierced by a skylight which lights the vestibule, and also to some extent the basilica itself through an elliptical window above the door of the latter. This window recalls another of the same form to be seen in the lower chamber of the tomb of Caecilia Metella. The passage, which has partly crumbled away, leading to the vestibule, had a barrel vault constructed, like the walls, of tufa concrete.

¹ C. PROMIS, *Le antichità di Aosta*, pp. 164-8.

² RIVOIRA, *Lombardic Architecture*, vol. i, pp. 247, 248.

³ VITRUVIUS, VI, xi, 4, 6, 7.

⁴ *Notizie degli scavi*, vol. xv (1918), pp. 30-52, GATTI and FORNARI, *Monumento sotterraneo*

presso Porta Maggiore in Roma. [*Journal of Roman Studies*, vol. ix (1919), pp. 78-85, BAGNANI, *The Subterranean Basilica at Porta Maggiore*. *Revue Archéologique*, 5 ser., vol. xviii (1923), pp. 1-23, CARCOPINO, *Encore la Basilique de la Porta Maggiore*.]

It is supposed that the building belonged to the Statilii, that its purpose was the celebration of mystic rites, and that it was constructed in the first decades of the Empire.¹ The structure of the walls, together with the entire absence of tile or brick-work, the character of the reticulate in the remains of the parapet of the lighting-shaft, and of a pedestal standing at the entrance of the nave (in both cases recalling the reticulate of Augustan buildings), all suggest a date in the reign of Augustus.



Fig. 35. Aosta. Wall of the Roman theatre

(5) Hitherto there has been some doubt whether Rome possessed *Thermae* in the time of Augustus, or only mere bath-rooms. Some years ago I wrote two short papers on the question, which I here summarize with corrections and additions in the hope of shedding some new light on the subject.²

The Greeks from early times had public baths as adjuncts of the *palaestra* and *gymnasium*. But very little is known about their form; so that it is difficult

¹ See the reference in the preceding note. [Sig. Rivoira was one of the first to examine the newly discovered basilica, and he was quite clear about its date. But he declined to express any opinion about its purpose, as being outside his province, and the views mentioned in the text merely represent the ideas current in 1918-19.]

² *Rivista di Roma* (1910), pp. 378, 379, 411, 415, RIVOIRA, *Origini delle Terme dei Romani. Le Terme di Diocleziano a Roma*. RIVOIRA, *The Roman Thermae. The Baths of Diocletian*. Paper read before the British and American Arch. Society of Rome (February 1910).

to identify those of which any remains survive, and to resolve the doubt which still prevails as to the origin of the plan and construction of the Roman *Thermae*.

At Assos in the Troad there are the remains, excavated in 1883, of public baths in three stories, adjacent to the Agora. The plan shows a long corridor on which open thirteen square rooms, in one of which at least the water was introduced from above for a shower-bath. These are believed to be of pre-Roman date. Baths of the Roman period, erected beside them, belong to the years A.D. 14-37.¹

The public baths of Eretria, the remains of which were brought to light in 1895, are of a different type, and the destination of the various apartments is not clear. A round chamber, however, seems to have been a vaulted calidarium though not provided with a heating apparatus, so that portable braziers must have been used instead. The date is thought to be not earlier than the first century B.C.²

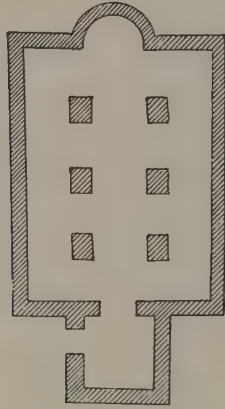


Fig. 36. Rome. Subterranean basilica outside the Porta Maggiore

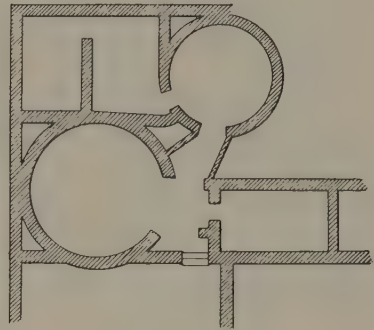


Fig. 37. Oeniadae. Plan of the Baths (From MARQUAND, *Greek Architecture*)

At Oeniadae, on the other hand, the remains of baths, discovered during the excavations of 1900-1901, include a rectangular room containing a bath, which will correspond to the frigidarium of Vitruvius; a large circular chamber, perhaps the tepidarium; a smaller circular room, apparently the laconicum or calidarium; together with other rooms on a smaller scale, presumably for the use of the attendants (fig. 37). Their erection is ascribed to the last age of Greek independence.³ But, as compared with the previous examples, the progress which is apparent in the grouping of the rooms and the greater variety in their shapes suggest that the baths of Oeniadae are of more recent date than the others, and not older than the first century B.C.

Others before now have pointed out that the plan of the baths of Oeniadae was used at Pompeii for the design of the more highly developed Stabian Baths and those near the Forum.⁴

¹ CLARKE, BACON, KOLDEWEY, *Expedition of the Archaeological Institute of America. Investigations at Assos*, part i.

² *American Journal of Archaeology. Papers of the American School of Classical Studies at Athens* (1896), RICHARDSON, *The Gymnasium at*

Eretria.

³ *American Journal of Archaeology*, 2nd s., vol. viii (1904), pp. 216 ff., SEARS, *Oeniadae. A Greek Bath*.

⁴ MARQUAND, *Greek Architecture*, p. 328.

The Stabian Baths are the earlier of the two. Erected by the Samnites in the second century B.C., they were remodelled by the *duoviri* C. Vilius and P. Aninius soon after the settlement at Pompeii of a colony of Roman veterans in 80 B.C.¹ On this occasion there was applied to the men's caldarium the system of hollow floors which had been invented shortly before by C. Sergius Orata.² Next, heating-pipes were introduced in the walls. Later, both systems were extended to the next chamber, the tepidarium, which hitherto had been heated by braziers like that of the baths near the Forum, erected soon after 80 B.C. and employing from the first the new method of heating in its caldarium.³ These improvements were also gradually introduced into the women's side of the baths.

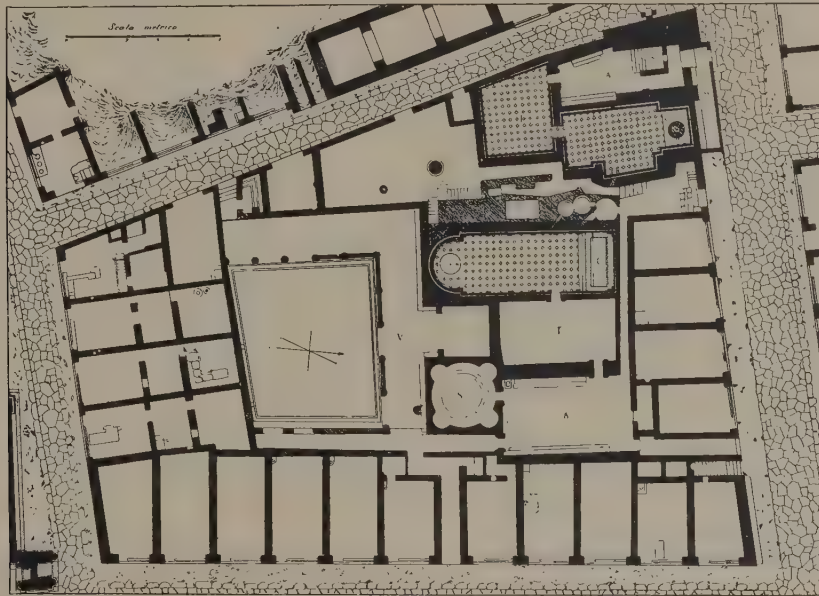


Fig. 38. Pompeii. Plan of Baths near the Forum
(From *Dissertazioni della Pont. Accad. Rom. di Arch.*, x)

I ought to note here that, according to a recent paper on the baths near the Forum at Pompeii,⁴ the circular room with niches was not, like the similar one in the Stabian Baths, a frigidarium as generally believed,⁵ but a sudatorium (figs. 38, 39). The Romans of the Republican age had no frigidarium in their ordinary baths, and when introduced into the Thermae it was open to the sky and usually of rectangular shape. Republican baths contained only sudatorium, caldarium, and tepidarium. The key-ring of the vault, with an

¹ HERMES, xviii (1883), p. 167, T. MOMMSEN, *Italische Bürgercolonien*.

² VALERIUS MAXIMUS, ix, 1. PLINIUS, *H. N.*, ix, 168.

³ MAU, *Pompeii in Leben und Kunst*, chap. xxvi, xxvii, xxviii.

⁴ *Atti della Pontificia Accademia Romana di*

Archeologia, vol. x, ser. 2^a, part 1^a, pp. 123-45. LUGARI, *Il Laconicum e la Sudatio nell' antico bagno romano*.

⁵ *Descrizione di Pompeii*, pp. 161-7. DAREMBERG, SAGLIO, *Dictionnaire des Antiquités*, vol. i, pp. 647-64. THÉDENAT, *Pompeii*, pp. 101-9. GUSMAN, *Pompeii*, p. 163.

opening as directed by Vitruvius in the case of a sudatorium,¹ tells in favour of this view.

The Stabian Baths are far in advance of those of Oeniadae, as is shown by : (1) the novelty and variety of plan ; the sudatorium being the prototype of the baptistery and the laconicum, with niches to hold basins and small baths (fig. 40) ; while the caldarium is of basilica plan : (2) the new methods of producing and conducting hot air and hot water : (3) the introduction in the haunches of the vaulting of pottery jars and hollow tubes set horizontally.

We have in them, so far as the bath-rooms are concerned, a model of the Roman public bath of the time of Vitruvius,² designed for cleansing and sanitary purposes only. Perhaps it was Romans who applied it to the Stabian Baths when they were remodelled, and to those near the Forum on their first erection. They differ from Roman baths by the addition of the palaestra or gymnasium, which had no place in Italian life.³ On the other hand they are substantially different from the Greek public bath, which was essentially a palaestra or gymnasium with bath accommodation added. They contain the germ of the Roman public *Thermae*, a balanced combination of the Greek gymnasium and the Roman bath. The Roman *Thermae* were embodied in buildings which are reckoned by those best qualified to judge among the artistic wonders of the world,⁴ and were carried by Rome to the countries which formed part of her empire.

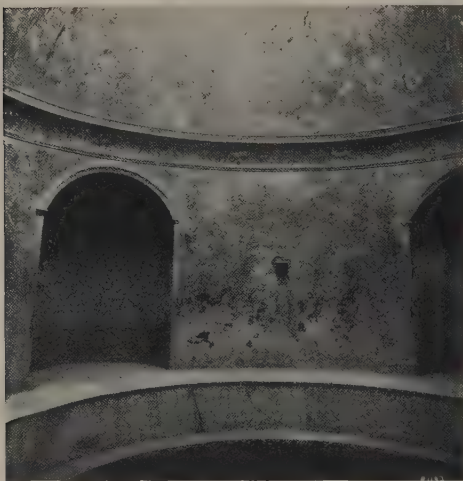


Fig. 39. Pompeii. Baths near the Forum

But the Eternal City contained no *Thermae* when Vitruvius wrote his treatise. What he describes are baths pure and simple, and intended for winter use only.⁵ He says nothing about baths for summer use ; an omission which was supplied by his abbreviator, Faventinus.⁶

We know nothing about the form of Agrippa's 'laconicum', dedicated with the adjacent Pantheon in 25 B.C. ;⁷ that is to say, whether it followed the type of bath described by Vitruvius, or whether it was primarily a place for inducing perspiration, and then for gymnastic exercises after the Spartan or Laconian fashion, as Lugari believes.⁸ We may add that he also thinks that the laconicum was the heating apparatus, the metal condenser which warmed the sudatorium, and that is how the latter got the name. In any case there is no question of *Thermae*, for there was no aqueduct to supply them.⁹

The *Thermae* of Agrippa were erected six years later, in 19 B.C., when the Aqua Virgo was brought to Rome.¹⁰ The new building then lost its original name,

¹ VITRUVIUS, V, x, 5. ² VITRUVIUS, V, x.

³ VITRUVIUS, V, xi, 1.

⁴ DAREMBERG, SAGLIO, op. cit., vol. ix, pp. 214-19.

⁵ VITRUVIUS, V, x.

⁶ FAVENTINUS, *Liber artis architectonicae*, xvi. [Printed at the end of Vitruvius.]

⁷ DIO CASSIUS, liii, 27.

⁸ Op. cit.

⁹ *Notizie degli scavi*, 1881, pp. 276, 277, LANCIANI, *Delle terme di Agrippa*.

¹⁰ LANCIANI, *I Comentarî di Frontino (Atti della R. Accad. dei Lincei, ser. 3, Memorie, vol. iv)*, pp. 332, 333. [Ruins and Excavations, pp. 53, 56.]

and both the younger Pliny and Martial call it 'Thermae'.¹ The conception must have been derived from the baths of Pompeii, and it was, apparently, the forerunner of the Roman Thermae, which attained their full development under Nero.

We know nothing about the plan, as they were rebuilt by Hadrian² after his reconstruction of the existing Pantheon. The brick-stamps belong to the years 117-127.³ It was these rebuilt Thermae which are mentioned by Dio Cassius (about 155-240), who calls them a 'balaneion'.⁴ Their plan is one of the problems of Roman topography.⁵ I believe, however, that, approximately, it is represented by the one preserved by Palladio,⁶ who, though sometimes carried away by his imagination in his restorations of ancient buildings, was more accurate when recording plans and details. His plan requires the addition of the

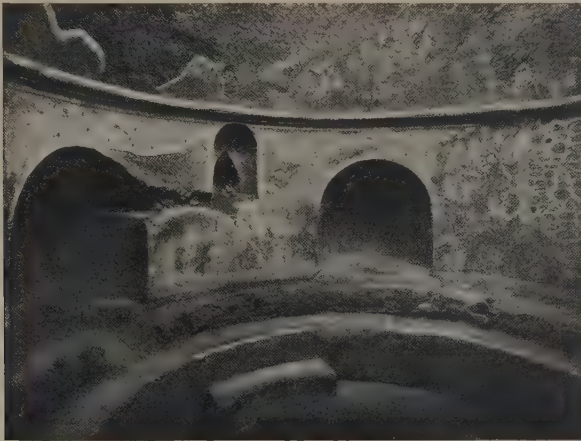


Fig. 40. Pompeii. Stabian Baths

calidarium on the south side, while the tepidarium will be the great hall, the remains of which exist to the south of the court-yard of the Accademia Ecclesiastica, and have been briefly described by Nibby⁷ and Lanciani,⁸ and examined by myself. It appears to me very unlikely that Hadrian would have erected great public Thermae in Rome radically different from those built by his predecessors Titus and Trajan.

I think that to the original building of Agrippa's Thermae belonged the circular tufa structure (evidently the laconicum), the remains of which came to light in 1893.⁹

¹ PLINIUS, *H. N.*, xxxiv, 62; xxxv, 26; xxxvi, 189. MARTIAL, III, xxxvi, 5.

² *Scriptores Historiae Augustae*, SPARTIANUS, *Hadrianus*, i, 19.

³ BELTRAMI, *Il Pantheon*, pp. 61-8.

⁴ DIO CASSIUS, liv, 29; lxvi, 24.

⁵ HUELSEN, *Die Thermen des Agrippa*, pp. 9 ff.

⁶ BERTOTTI, SCAMOZZI, *Le Terme dei Romani*, tav. i.

⁷ *Roma antica*, pp. 760-6.

⁸ *Forma Urbis Romae*, tavv. xv, xix.

⁹ BELTRAMI, *Il Pantheon*, pp. 64, 65.



II. TIBERIUS

WITH the accession of Tiberius (A.D. 14-37), the system of brick-facing which hitherto at Rome had been confined, with the exception of the tombs of Caecilia Metella and Gaius Cestius, to structures of moderate size, was extended to buildings on a great scale, viz. the palace of Tiberius on the Palatine, and the Pretorian Camp; with the result that the fashion of using reticulate in buildings of importance received a check. It seems that reticulate

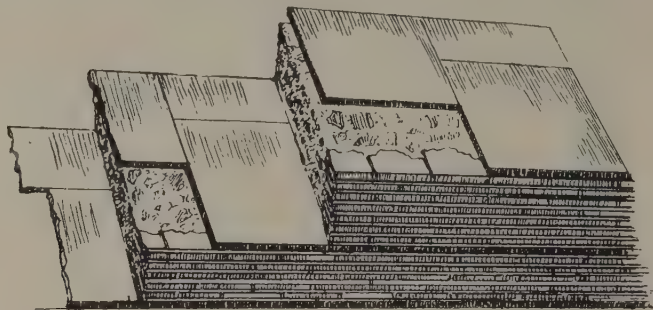


Fig. 41. Tile courses in the 'Domus Tiberiana' on the Palatine

was not combined with horizontal brick courses in the age of Tiberius, to judge by the internal chambers of the Praetorian Camp, and the Columbarium of the slaves and freedmen of the Arruntii, which also belongs to that period.¹

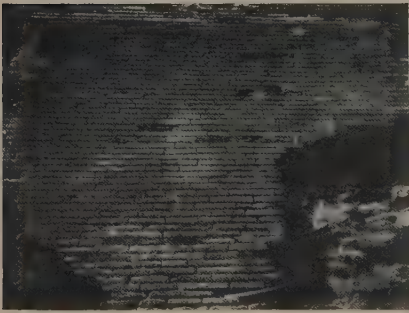
There have been discovered recently some remains of a Nymphaeum belonging to the 'Domus Tiberiana'² which looked towards the Aventine.³ The construction of the walls in their original state is as follows. The facing consists of courses of unflanged tiles broken in two, with the outer edge ground down, laid so that they fall alternately over the vertical joints, and set in a moderate quantity of mortar (fig. 41). The core is formed of layers of tufa lumps (mixed with tile fragments and lava chippings) set by hand at random on a bed of lime. At intervals of from five to seventeen courses there is inserted a layer of large tiles about 0.60 m. (2 ft.) wide, going right through the wall, and subdividing the whole mass into so many

¹ NIBBY, *Roma antica*, pp. 518, 519.

² TACITUS, *Historiae*, i, 27.

³ TACITUS, *op. cit.*, iii, 84.

sections intended to distribute the pressure equally. The foundation is of cast concrete with lumps of tufa, tile fragments, and lava chippings ; and is not topped by large flat tiles—that is to say the ‘*tegulae bipedales*’ of Vitruvius,¹ which were of two kinds : one perfectly smooth ; the other marked on both faces by channels about half an inch deep, like those for instance in the foundations of the palace of Domitian which rises above these remains. The barrel vaults, which were preserved when the palace was erected, were constructed by laying on wooden



Figs. 42, 43, 44, 45. Rome. Praetorian Camp
Specimens of external facing

centering, kept up by props, a good bed of lime, and then filling the thickness of the vault with layers of lumps of tufa thrown in irregularly, like the filling-in of the side walls, the vault being merely the arched continuation of the latter. The frontal arches were formed of large tiles (some of which are shaped as *voussoirs*), some broken in two, others perfect and intended to bind together : the former, the facing and the core ; the latter, the sections of the facing intervening between them.

THE PRAETORIAN CAMP was created by Sejanus (A. D. 23) at the order of Tiberius.² The enclosure, orientated slightly towards the north-east, is quadrangular, but

¹ VITRUVIUS, VII, i, 7 ; iv, 2.

² SUETONIUS, *Tiberius*, 37. TACITUS, *Ann.*, iv, 2.

the corners are not right angles but rounded, following the rule of Vitruvius as to the form of city walls: 'Towns should be laid out, not as an exact square, nor with salient angles, but in curved form' (*circumitionibus*), so as to give a view of the enemy from several points;¹ for the term 'circumitiones' applies to obtuse angles as well as curves. This rule is a compromise between the polygonal or the quadrangular form with curved corners and the Assyrian circular entrenched camp.

Important remains of the northern and eastern sides of the Praetorian Camp are incorporated in the walls of Aurelian (270-275) and Probus (276-282),² and



Fig. 46. Praetorian Camp. North wall

are easily recognized by a trained eye. The inner side, which was altered by Aurelian, had no brick facing, but the outer face (figs. 42, 43, 44, 45) consists of regular courses of tiles roughly trapezoidal, triangular, and oblong in shape, broken in two, unflanged, and with the outer edge ground down. There are not the large tiles at intervals going back into the core, which we found in the 'Domus Tiberiana'. It is embellished with a continuous moulded brick string-course, and is, both in material and execution, the finest piece of brickwork to be seen in Rome, at any rate before that of the time of Domitian and Trajan, and holding its own

¹ VITRUVIUS, I, v, 2.

² *Script. Hist. Aug.*, VOPISCUS, *Aurelianus*, xxvi, 21, 39. *Mon. Germ. Hist.*, *Auct. antiquis-*

simi, Chronica minora, vol. ii, p. 148, CASSIODORUS, *Chronica*. ZOSIMUS, *Historia nova*, i, 49.

with it. The wall was finished at the top by battlements with considerable intervals between them (fig. 46), something like those to be seen in the border of a mosaic in the atrium of the House of the Boar at Pompeii (fig. 47), representing the wall of a fortified city with towers. In the foundations there are some remains of reticulate.

If we may trust the parts which survive, there was a gate in each side, the brick jambs of which were united at the top by a flat arch. These gates were flanked by two low battlemented towers, with a string-course similar to that described near the top, and pierced on the exterior face by two small arched windows, the head being formed of one piece of terra-cotta with moulded edge. Seeing that they project only 30 cm. (1 ft.), it has been said that they are merely suggestions of towers.¹ On the contrary they had a real existence, as has been already pointed out² on the strength of passages in Tacitus (about 55-140)³ and Spartianus (under Diocletian).⁴ Moreover, it has not been recognized that each

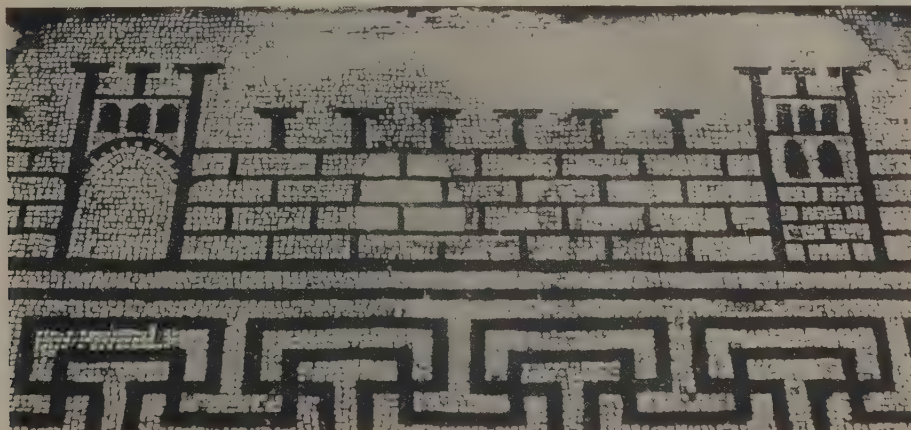


Fig. 47. Pompeii. Floor Mosaic in House of the Boar

side had two additional towers, narrower than the others, but of the same height, set between the gate in the centre and the ends of the wall. The north and east sides (figs. 48, 49) still preserve the outer face of one of them, each with the original small windows with terra-cotta heads as before. In addition, each angle had a tower with a curved face, as may be readily verified by an examination of the north-east corner (fig. 50).

To sum up, there were eight principal towers flanking the gates, and twelve smaller ones on the sides and at the corners. These sixteen towers, the remains of which unquestionably belong to the original construction, explain the passage of Tacitus just referred to, describing the fall of Vitellius: 'multi semianimes super turres et propugnacula moenium expiravere.'⁵

There are two peculiarities in the 'Castra Praetoria' which should be noticed. The first is that, while the wall was faced with brickwork, the guards' chambers

¹ NIBBY, *Le Mura di Roma*, pp. 326-36.

² JORDAN, HUELSEN, *Topographie*, vol. i², p. 388.

³ TACITUS, *Hist.*, iii, 84.

⁴ *Script. Hist. Aug.*, SPARTIANUS, *Didius Iulianus*, 5, 9.

⁵ ['Many wounded to death breathed their last upon the towers and battlements of the walls.']

inside were lined with reticulate. The other is the use of relieving arches in the foundations of the north-east corner of the wall, due to the nature of the ground and to the transition from a straight line to a curve. This was a new experiment of arches, not meant to relieve the flat heads of openings as hitherto, but intended to perform new constructive and static functions which were gradually to be developed and extended till they reached their culmination in the reigns of Domitian and Hadrian. One writer, not understanding the object of these relieving arches, says that they are quite useless.¹



Fig. 48. Praetorian Camp. Tower and Gate (blocked-up) in north wall

On leaving the Praetorian Camp one is reminded of the 'Amphitheatrum Castrense' near the basilica of Santa Croce in Gerusalemme, which some have thought was erected about the time of Tiberius,² though others believe it, and rightly, to be of much later date.³

The original structure, which is of brick and forms part of the line of the Aurelian walls, is represented by a series of arches springing from piers, each having an engaged column resting on a block of travertine, with a plain torus for base, and a Corinthian capital. Above are more scanty remains of an upper arcade, in which the piers had a pilaster instead of an engaged column (fig. 51). The brickwork of the outer

¹ MIDDLETON, *The Remains of Ancient Rome*, vol. i, pp. 58-60.

² CANINA, *Edifici*, vol. iii, p. 34; iv. tav.

clxxviii.

³ LANCIANI, *The Ruins and Excavations of Ancient Rome*, pp. 386-7.



Fig. 49. Praetorian Camp. Tower in east wall



Fig. 50. Praetorian Camp. North-east angle

face is yellow, red, and brown, producing a hybrid polychrome effect, and the workmanship cannot be compared with the brick facing of the Praetorian Camp. Besides, the insertion of travertine blocks in the angles of the piers does not belong to the age of Tiberius. The building seems to me to be later than the time of the Antonines (138-192), but not as late as that of Aurelian.

To return to our subject. One is astonished at the sudden appearance in Rome under Tiberius of the use in important buildings, such as the 'Domus Tiberiana', of the 'structura testacea' or brick facing (kiln-baked materials being the most convenient for building purposes) in place of reticulate, combined with courses of



Fig. 51. Rome. Amphitheatrum Castrense

large square tiles at intervals. This method of construction marked a change in Roman building, coinciding with the settlement of the Imperial system of government. Advance in construction is never made by leaps, nor in a mysterious manner, but always in ways which are apparent to all. In fact, progress of any kind, even in the case of a favoured race, never takes place *per saltum*.¹

From whom, then, did the Romans derive this method, which they, of course, handled in their own way? Apparently from the inhabitants of the left bank of the Po—the Transpadani: at any rate that is the verdict of modern writers and of historians, and it is confirmed by the actual evidence of the cities of Alba Pompeia (Alba in Piedmont) and Augusta Taurinorum (Turin).

Varro (116-27 B.C.) tells us that fire-baked bricks were used for walls in Gaul:

¹ HOGARTH, *Ionian and the East*, p. 117.

'huius fere species quattuor, quod fiunt e lapide, ut in agro Tuscolano, quod e lateribus coctilibus, ut in agro Gallico, quod e lateribus crudis, ut in agro Sabino, quod ex terra et lapillis compositis in formis, ut in Hispania et agro Tarentino.'¹ At Alba, which is supposed to have derived its surname of Pompeia from Cn. Pompeius Strabo (died 87 B.C.), and having become a Latin colony in 89 B.C. was assigned to the Camilian tribe (78 B.C.), considerable remains of the walls of this period have recently been discovered, the circuit being of the polygonal form, with which the Romans were familiar.² The thickness of the walls is 2.40 m. (7 ft. 10 in.) above the level of the foundations, which are 1.20 m. (3 ft. 11 in.) deep and formed of a mass of large pebbles from the Tanaro set in very hard mortar. The original structure has a core of pebbles and gravel set in very hard lime, and faced on both sides with fine unbroken bricks of about 45 × 30 cm. (17 $\frac{3}{4}$ × 11 $\frac{3}{4}$ in.) and 8 cm. (3 $\frac{1}{4}$ in.) in depth (fig. 52). Pairs of unbroken bricks are bonded into the core, and between every three pairs a horizontal course, also formed of two rows of bricks, runs right through the wall, each of such courses marking a set-off on the face of the wall. This method of binding together the two faces with courses of brick is a substitute for the olive-wood ties hardened by fire (*taleae ustilatae*) which are recommended by Vitruvius.³

Turin was one of the twenty-eight colonies founded by the emperor under his name of Augustus,⁴ and therefore not before 29 B.C., when Octavian had it conferred on him by the Senate. The date was probably about 28 B.C.⁵ Connected with this foundation was the completion of the town-wall, begun, according to Carlo Promis, by Julius Caesar between 49 and 44 B.C., and carried out only on the west and south sides. The walls on these sides, where the town is on the same level as the country outside, were provided with an internal corridor having an arcade with piers looking inwards, and loopholes looking outwards, forming a second sentry-walk and a second line of defence. Some account of the origin of this kind of 'arcus fornicatus' will be given under Aurelian (270-275). The wall on the west and south sides was built in *opus incertum*, but what the construction of the corridor was we do not know.⁶

On the northern and eastern sides visible remains of the Augustan walls exist above ground in the gardens of the Royal Palace (figs. 53 and 54), by the Porta Palatina, and near the church of the Consolata; together with considerable parts of the two principal gates, viz. the present Porta Palatina, and the Decumana. The

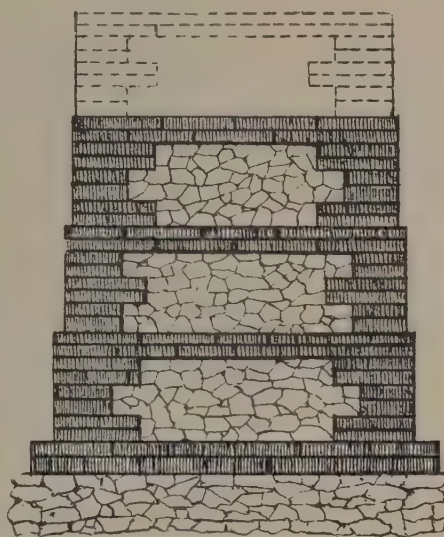


Fig. 52. Alba Pompeia. Section of the wall

¹ VARRO, *Res rusticae*, i, 14.

² PAIS, *Dalle guerre puniche a Cesare Augusto*, vol. ii, pp. 717-25. *Miscellanea Salinas* (Palermo, 1907), pp. 179-200, F. EUSEBIO, *Le mura romane d'Alba Pompeia*.

³ VITRUVIUS, I, v, 3.

⁴ MOMMSEN, *Res gestae Divi Augusti*, p. 123.

⁵ HAVERFIELD, *Ancient Town Planning*, pp. 86-9.

⁶ C. PROMIS, *Storia dell' antica Torino*, pp. 57, 58, 69, 70, 176-80.

remains of the wall consist of a concrete core formed by an extremely hard mass of pebbles (whole or split) and bits of stone set in lime mixed with gravelly sand (not sifted) and a certain amount of pounded brick. This core has a facing on the outer front (with slight sets-off) of unbroken bricks of such excellent material and firing that they rival those at Rome, though, unlike the latter, they have no grains of pozzolana mixed with the clay, which temper it and prevent a good deal of cracking in the process of firing. These bricks, measuring approximately $45 \times 30 \times 8$ cm. ($17\frac{3}{4} \times 11\frac{3}{4} \times 3\frac{1}{4}$ in.), are laid with great exactness on thin beds of very hard sandy mortar, and are uniform in size: any difference noticeable between them has taken place in the drying or baking, according to the degree of elasticity in the clay. The inner face towards the town, on the other hand, is lined with river pebbles, split in two and set with the flat side outwards. From top to bottom



Fig. 53. Turin. Remains of the Roman walls in the garden of the Royal Palace

the wall is strengthened with bonding ties forming part of the brick facing, each consisting of two courses of bricks, every fourth one being a band of unbroken or whole bricks, like the others, which runs right through the thickness of the wall. The result is that the internal pebble-facing presents a wall of fine *opus incertum* banded with brick bonding-courses (fig. 55). On the outer face near the top is a continuous string-course of quarter-circle profile.

As these northern and eastern walls stood originally on the edge of a declivity, the continuous walk behind the battlements was sufficient, and there was no internal passage.

The Porta Palatina (fig. 56), a large part of the outer face of which still exists, is flanked by two sixteen-sided towers, which now have only four floors, though originally they seem to have had five at least, as in the case of the Porta Decumana now built up under the Palazzo Madama. Its existence was only discovered of late years (fig. 57).¹ This is the earliest instance I know of towers with many sides.

¹ *Relazione dell' Ufficio Regionale per la conservazione dei monumenti del Piemonte e della*

Liguria, parte i (1883-1891), D'ANDRADE, *Città di Torino*, pp. 7-18.

Philo of Byzantium mentions only the circular, tetragonal, pentagonal, and hexagonal forms.¹ These towers recall the one which survives from the Roman walls of Asti, known as the 'Torre Rossa' or tower of San Secondo. It was altered some time after 1070 in order to convert it into a bell-tower (fig. 58). This form was selected because, while approximating to the circular, it avoided the constructive difficulties inherent in the latter.



Fig. 54. Turin. Part of the Roman wall in the garden of the Royal Palace

The wall between the towers is built entirely of admirable brickwork, consisting in the two upper stories of the ordinary sesquipedal or foot-and-a-half bricks, while the ground floor is also of brick except for a broad band of undressed stone, intended to receive an inscription which was never cut. These and other details I owe to information received from Signor Berteau, who was in charge of the last restoration.

The two large archways have brick voussoirs measuring on an average $80 \times 40 \times 8$ cm. ($31\frac{1}{2} \times 15\frac{3}{4} \times 3\frac{1}{4}$ in.). The sides of the passages have a saw-tooth surface

¹ THEVENOT, *Veteres Mathematici* (Paris, 1693), *Ex opere Philonis*, lib. v, pp. 78-104.

Revue de Philologie, N. S., vol. iii (1879), p. III, DE ROCHAS, GRAUX, *Philon de Byzance*.

produced by indentation of the bricks. A similar curious treatment of the surface may be seen in the Porta Decumana. The two smaller passages have the indentation on one side only, namely that next to the tower. These peculiar features seem to have had as their object, in the case of the smaller openings to indicate to foot-passengers, by means of the smooth and therefore inoffensive surface, the side to



Fig. 55. Turin. Porta Palatina. Inner face of wall
(during restoration)

take in coming in or going out ; while in the principal passages their purpose was to protect the walls from the friction of wheeled vehicles. The voussoir-bricks of the smaller arches measure 80×26 cm. ($31\frac{1}{2} \times 10\frac{1}{2}$ in.) and are $6\frac{1}{2}$ cm. ($2\frac{1}{2}$ in.) thick.

Above the arched passages are two stories of open galleries, the façade being decorated in quiet but elegant fashion with string-courses and pilasters, all in brick. The windows of the top story have relieving arches.



Fig. 56. Turin. Porta Palatina

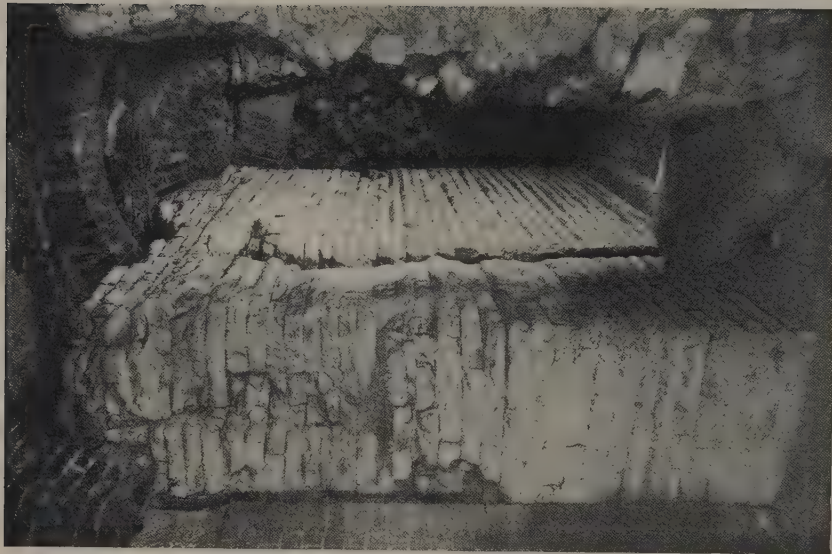


Fig. 57. Turin. Remains of the Roman Porta
Decumana under the Palazzo Madama

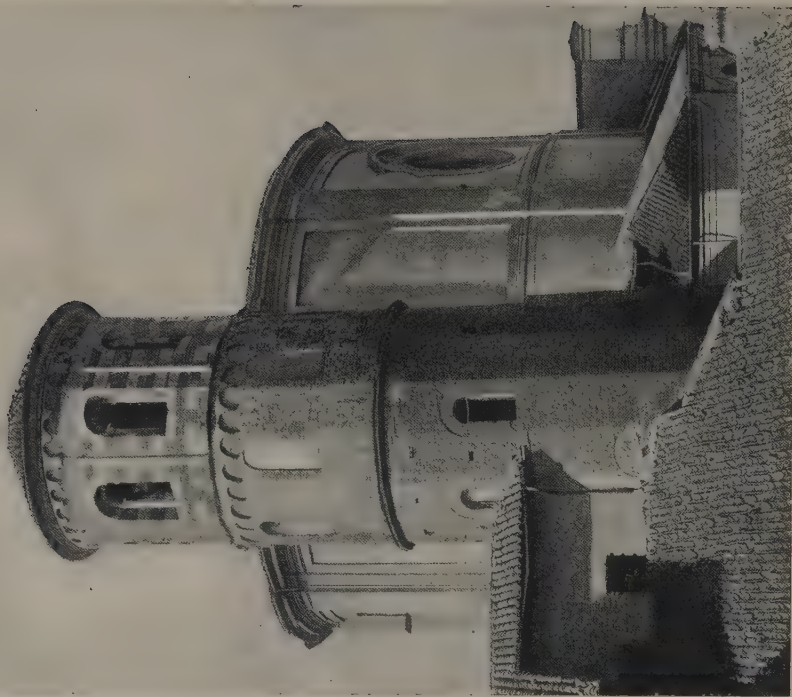


Fig. 58. Asti. Tower of S. Secondo.

The towers are entirely built of brick, and here again the joints and beds are of the most careful execution. Inside they have cornices of ovolo profile to carry the planks for the floors. The way in which they rise from their base is original. The base consists of a quadrangular foundation surmounted by four sections of pyramids built of bricks set in retreating courses, which thus form a transition from the quadrangular base to the polygonal tower (fig. 59).

The towers form an organic whole with the front wall only up to the impost of the outer passages: above this it can be seen that they are independent. This suggests that they were built separately. Moreover, they are not bonded into the city wall, a peculiarity which occurs with other towers in the circuit of the walls.



Fig. 59. Turin. Porta Palatina during restoration

From all this it may be inferred that the gates and the bases of the towers were erected first, and that later the towers were completed and the walls connecting them built.¹ Nevertheless I think that, owing to their great height, the towers were kept independent for fear that the settlement in their case being greater might produce cracks in the masonry.

Similar independent construction may be seen at Como in the Roman gate with octagonal towers, which was replaced by the medieval Porta Torre.² The idea of making towers independent of walls is of great antiquity, for it was known in the time of Philo of Byzantium (second century B.C.).³

It may be noticed here that the type of gate with four passages, two larger and

¹ D'ANDRADE, *op. cit.*, pp. 18-21.

² *Notizie degli scavi*, vol. xii (1915), pp. 297-301, PATRONI, *Como, Porta Romana*, &c.

³ THEVENOT, *Veteres Mathematici* (Paris, 1693),

Ex opere Philonis, lib. v, pp. 78-104. *Revue de Philologie*, n.s., vol. iii (1879), p. 141, DE ROCHAS, GRAUX, *Philon de Byzance*.

two smaller (each pair of which corresponds to the direction in which foot-passengers and vehicles enter or leave the city), with a gallery above, was reproduced in the Porte d'Auguste at Nîmes (15-16 B.C.) (fig. 60), where the bracketed column in the middle should be noticed. Other examples are the Porte d'Arroux and the Porte Saint-André at Autun.¹

Doubts have been thrown on the Augustan date of the existing walls and gates of Roman Turin, on account of some of the bonding courses.² Now, repeated examination of the portions which are unquestionably original has made it clear to me that the method of bonding bricks and courses is exactly the same in both. It has also convinced me that the brickwork, both as regards the quality of the



Fig. 60. Nîmes. Porte d'Auguste

bricks and the mortar, and also the workmanship, show that it was done by one and the same set of hands. And I am convinced that these remains belong to the age of Augustus, a date also indicated by sundry brick-stamps and an inscription, which were discovered during the last restoration of the Palazzo Madama.³ This dating is not affected by the fact that the strip of white tufa across the front between the towers of the Porta Palatina is devoid of an inscription, for in the contemporary Aosta, the 'Augusta Praetoria Salassorum', founded after Varro had exterminated the Salassi (25 B.C.) (not entirely, however, as Strabo says,⁴ for some of them were included in the Roman colony⁵), the Porta Praetoria was provided with a band for an inscription which was never cut.⁶

¹ BLANCHET, *Les enceintes romaines de la Gaule*, pp. 14-20, 206-II, tav. xx.

² HAVERFIELD, *op. cit.*, pp. 86-9.

³ D'ANDRADE, *op. cit.*, p. 10.

⁴ STRABO, IV, vi, 7.

⁵ *Rendiconti della R. Accad. dei Lincei*, ser. 5, vol. xxv, pp. 3-27, PAIS, *Sulla romanizzazione della Valle d'Aosta*.

⁶ PROMIS, *Torino*, p. 214; *Le antichità di Aosta*, pp. 147, 148, 172.

The walls of Alba and Turin, belonging respectively to the pre-Augustan and Augustan periods, give us a good deal of information. I will call attention to the chief points.

I. The bricks are, so far as the superficies is concerned, of the type used by the Romans in the time of Vitruvius, viz. the foot and a half or sesquipedal ('longum sesquipedale, latum pede ¹'), and before them by the Etruscans. The reduction in thickness, as compared with the Etruscan bricks, was the result of experience: the thicker bricks are, the more readily they break in drying or baking. This led the Romans to make them as thin as possible.

Bricks of this type, which Vitruvius says were called Lydian in Greek,² are commonly believed, e. g. by Choisy,³ to have come to the Romans probably from the

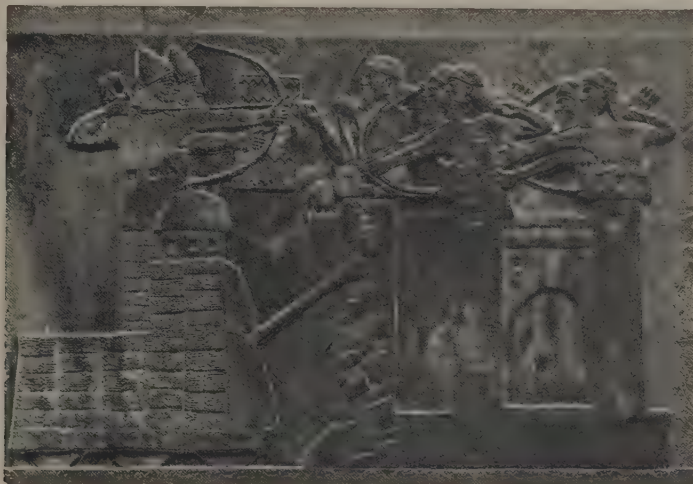


Fig. 61. British Museum (Nimroud Gallery, 5 a). Relief of the siege of a city by Assur-nasir-pal (885-860 B. C.)

Etruscans, who brought them from their original home in Lydia. I only remark that, if among ancient authorities Herodotus (c. 484-406 B. C.) makes the Etruscans come from Lydia,⁴ and his opinion was accepted by the Roman writers,⁵ on the other hand Dionysius of Halicarnassus,⁶ who flourished in the time of Augustus, and had been in contact with the Etruscans, refuted this theory of their origin by sound arguments, and held that their native home was in Italy. We know that the mystery about the origin of the Etruscans is still unsolved,⁷ and it will remain a mystery until more attention is paid to the evidence of palaeography and the comparative history of ancient styles of architecture than to that of utensils and jewellery. And I will add this, that the Etruscans, who emerge in Italy from the

¹ VITRUVIUS, II, iii, 3.

² VITRUVIUS, *ibid.*

³ CHOISY, *Vitruve*, vol. i, p. 8.

⁴ HERODOTUS, i, 94.

⁵ MARTHA, *L'art étrusque*, pp. 9-30.

⁶ DIONYSIUS HALICARNASSENSIS, *Antiquitates Romanae*, i, 30.

⁷ *Atti e memorie della R. Deputazione di Storia Patria per la Romagna*, ser. 4, vol. iv, pp. 237-84, GHERARDINI, *La questione etrusca. Atti del Congresso internazionale di Scienze Storiche* (Rome, 1903), vol. v, p. 452, PINZA, *Le origini di alcuni tipi dell' Architettura sepolcrale Tirrena nel età del ferro.*

obscurity of pre-history about the ninth century B.C., whose name and culture dominate the early history of Italy from the eighth to the third century before our era, who had commercial and cultural relations with the oldest peoples of the



Fig. 62. Perugia. Arco di Augusto

East, and who displayed as early as the seventh and sixth centuries B.C. a national civilization of such refinement that it will bear comparison with that of such famous centres as Crete and Mycenae,¹ would have been capable of introducing in Italy

¹ *Pontificia Accad. Rom. di Arch., Dissertazioni*, vol. xi, ser. 2, pp. 123-39, NOGARA, *Dell' influenza esercitata dall' Etruria sulla civiltà*

e sull' arte Romana. Bolletino dell' Assoc. Arch. Rom., anno v, pp. 9-36, NOGARA, *Influenza degli Etruschi, &c.*

directly, without any hypothetical intervention of the Lydians, the previously unknown art of making bricks out of clay, and also of baking them in an oven, in whatever shapes their fancy suggested.

Accordingly, until we have precise information about the dimensions (including the thickness) of the bricks used in Lydia before the time of Augustus, we may regard the Roman sesquipedal type measuring 0.296×0.444 m. as of Italian origin, and derived from the Etruscan sesquipedal brick that we found at Arezzo and Perugia.

The use in the walls of Alba Pompeia and Turin of sesquipedal bricks, not 12 cm. ($4\frac{3}{4}$ in.) thick like those at Arezzo and Perugia, but only 8 cm. ($3\frac{1}{4}$ in.), suggests that the Romans had already arrived at a more reasonable thickness; or rather that the change had been made in the Transpadane districts, and learned from thence by the Romans. At any rate it is certain that as time went on the



Fig. 63. Perugia, Porta Marzia

Romans, apparently from the reign of Claudius (41-54) onwards, diminished the thickness still further.

II. The bonded type of masonry known as 'emplecton' is not Roman. Before this the Romans had used quoins and bonds only at the most important points, that is to say at angles and in jambs. Nor is it Greek. The Greeks had built whole lengths of wall with stretchers, the joints coming over the centre of the blocks below, and then tied them together with through-stones placed at intervals. On the contrary this is a new method, the result no doubt of Greek influence, but simplified by the use of mere continuous bands or through-stones, instead of the system of headers and stretchers, and it seems to have originated in the Transpadane district. The Romans in taking it over made it more economical by the use of triangular or half-bricks, and by reducing the number of ties and courses of ties, consisting of large square tiles instead of bricks.

III. The open galleries on the face of the Porta Palatina are an Etruscan invention, which has no parallel in previous styles of architecture. The Etruscans were the first to run sham galleries above their city gates, which they further

emphasized by the projection of the impost, while they decorated the outer face of the arch by a broad moulded outer band, the latter feature being ultimately of Assyrian origin (fig. 61).¹ This is illustrated by the 'Arco di Augusto' (fig. 62) and the remains of the 'Arco di Porta Marzia' at Perugia, which is in the Etruscan style, as shown by the architectural ornament and the pro-



Fig. 64. Faleri. Porta di Giove

jecting heads ('protomi') in the spandrels and above the keystone of the arches (fig. 63). With this last feature, also an Etruscan invention and not confined to city gates but found sometimes on cinerary urns, I have dealt elsewhere.² The following are examples of it :

(1) The so-called 'Porta di Giove' or 'Porta Augustea' and the 'Porta di

¹ PERROT, CHAPIEZ, *History of Art in Chaldaea and Assyria*, vol. i, p. 227, fig. 91.

² RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 121, 173, 181, 192.

Bove' at Faleri, dating from 241 B. C., when the ancient Falerii was destroyed and the new Etrusco-Roman town took its place (fig. 64).¹

(2) The two gates at Perugia just mentioned, which have been dated as far back as the fourth century B. C.,² but really are not older than 241 B. C., when the walls of Falerii were provided with gates which had no sham galleries, but must be earlier than the year 40 B. C., when Octavian put the city to fire and sword,³



Fig. 65. Volterra. Porta all' Arco. Outer face

and the final extinction of the Etruscans as a nation took place. It is obvious that in design and execution these gates are earlier than the advent of the Imperial Roman classical style.

(3) The 'Porta all' Arco' at Volterra, which is in its original state, except

¹ *Corpus scriptorum historiae Byzantinae*, ZONARAS, *Annales*, viii, 18.

Italy and Dalmatia, pp. 130, 131.

² DIO CASSIUS, xlviii, 14.

³ FROTHINGHAM, *Roman Cities in Northern*

the barrel vault with its small oblong stones (figs. 65, 66). We may notice that it is constructed of three kinds of stone: large square blocks of the ordinary yellow tufa known as 'panchina' for the piers, this part of the work being of the same date as that of the walls, which are generally believed to be earlier than the siege by Sulla mentioned by Strabo; ¹ local grey tufa, easy to work but hardening on exposure to the air, for the outer and inner arches and the impost mouldings;



Fig. 66. Volterra. Porta all' Arco. Inner face

black porous stone liable to disintegration by the action of the weather, brought from Montecatini in the Val Cecina, for the three large projecting heads (protomi) which are contemporary with the gate. The date must be the fourth century B. C., for, as far back as the third or at latest the second century, a cinerary chest of local production (now in the Museo Guarnacci at Volterra) has a representation of the siege of Thebes, showing a gate of exactly the same pattern as the 'Porta all' Arco' ² (fig. 67).

¹ STRABO, V, ii, 6.

² DENNIS, *The Cities and Cemeteries of Etruria*, vol. ii, p. 144.

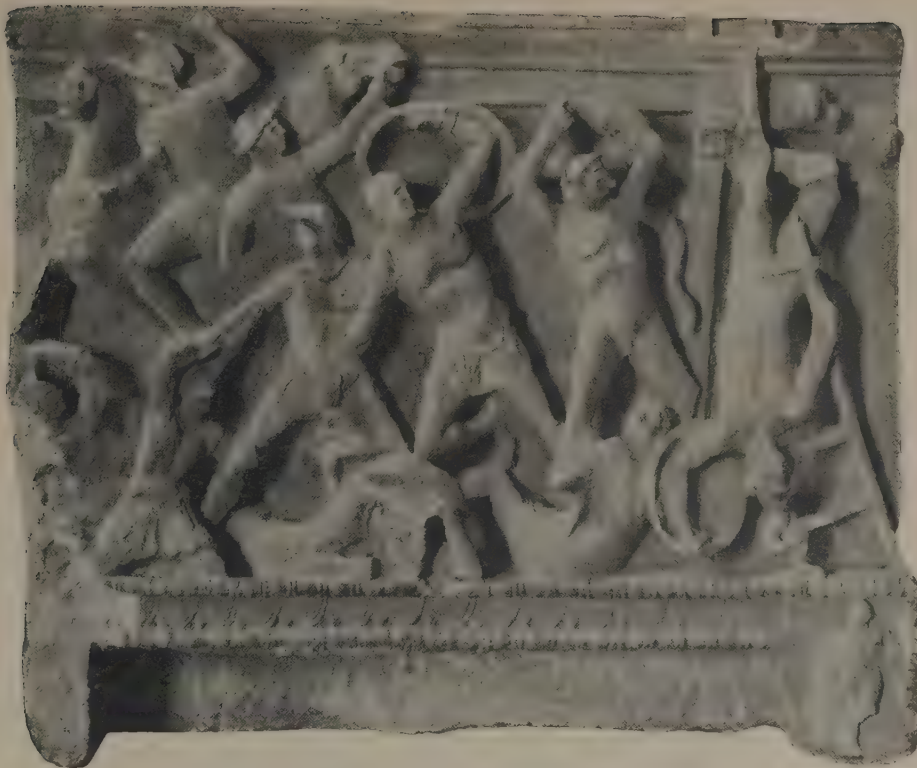


Fig. 67. Volterra. Museo Guarnacci. Cinerary chest



Fig. 68. Fano. Arch of Augustus

It was the official architect of the walls of Turin who introduced the open galleries there, and I fancy he must have come from Etruria, or been influenced by Etruscan fashions. The design was subsequently used in Italy under Augustus for the gates of Aosta (25 B. C.) and Fano (A. D. 9 or 10) (fig. 68), which still survive. But the most imposing example is the Porta Nigra of Trier, which belongs to the fourth century A. D.¹ (fig. 69).

¹ RIVOIRA, *Lombardic Architecture*, vol. ii, p. 284.



Fig. 69. Trier. Porta Nigra. Outer face



III. CALIGULA

UNDER Caligula (A.D. 37-41) it seems that, for important buildings not built of solid masonry, the two favourite forms were walls with brick facing, and reticulate facing with brick used in the parts where greater solidity was required. I say 'it seems'; for of the emperor's two chief works—the 'Domus Gaiana', and the Circus of Gaius and Nero in the gardens at the Vatican—the former is a puzzle, while the latter has left no visible remains.

'DOMUS GAIANA' or House of Caligula (fig. 70). Suetonius (c. 65-135) says that Caligula extended the House of Tiberius to the Forum ('partem Palatii ad forum usque promovit') and intended to make the temple of Castor and Pollux its vestibule.¹ The Imperial residence at this time covered so vast an area that the elder Pliny writes: 'bis vidimus Urbem totam cingi domibus principum Gai et Neronis, huius quidem ne quid deesset, aurea.'² Some have thought that it was extended by means of terraces as far as the Nova Via, crossing the Clivus Victoriae on a vaulted gallery; others, however, do not believe that it crossed the Clivus.

It is not easy, even for one with expert knowledge of Roman construction, to find one's bearings in the complicated tangle of ruins supposed to belong to the House of Caligula, owing to the additions which have been made to it, the alterations it has undergone, and the restorations carried out, especially after the great fires under Nero and Commodus.³ For my own part, I confine myself to making the following observations.

(1) The barrel vaults of the gallery mentioned above (strengthened later by sub-arches which cut the continuous impost cornice) do not belong to the time of Caligula, for they contain triangular bricks, and show traces of square tiles in the intrados, both of which are later innovations belonging respectively to the ages of Claudius and of the Flavian emperors (69-96). We may also exclude from the work of Caligula the grand staircase from the Forum to the Clivus Victoriae, which it is agreed was constructed under Domitian; the small external gallery, carried on arches springing from corbels and facing on to the Clivus (it reappears on the 'Area Palatina'), which also belongs to the time of Domitian; the cryptoporticus where the murder of Caligula is supposed to have taken place, the walls

¹ SUETONIUS, *Caligula*, 22.

³ DIO CASSIUS, lxii, 18; lxxii, 24.

² PLINIUS, *H. N.*, xxxvi, III.

of which contain triangular bricks; and the rooms (which have been ascribed to Caligula¹) on the east side of the Clivus, built of reticulate with horizontal bands and quoins of brick, for such treatment is not found before the reign of Claudius.



Fig. 70. Remains of the House of Caligula on the Palatine

(2) An examination made, wherever possible, in the rooms on the west side of the Clivus Victoriae, has led me to the conclusion that in the great works of Caligula the building methods of the 'Domus Tiberiana' were continued, and all the vaults were of semicircular form, constructed of tufa lumps laid by hand in an irregular way, without the use of pottery jars or amphorae to reduce the weight. I withdraw what I had formerly written on this point.² It is not that the Romans in the time of Caligula were ignorant of the use of pottery vessels in vaulting, for, long before, the Campanians had employed them at Pompeii. But in Rome they are not found before the age of the Antonines (138-193).

(3) The House of Caligula lost its name, as it was absorbed in that of the House of Tiberius, the residence of Antoninus Pius, Marcus Aurelius, and Lucius Verus, which alone survived.³

THE CIRCUS OF GAIUS AND NERO was begun by Caligula as a memorial to Augustus and Tiberius, and was finished by Nero.⁴ It consisted of three distinct concentric walls which carried the tiers of seats. The remains seen by Grimaldi (d. 1623) consisted of walls of reticulate with brick arches supporting the seats: 'murus ex quadratis lapidibus fabrefactus . . . (Parietes)

lateritii sustinebant olim arcuatos fornices.'⁵ There is no mention of bonding courses or bands of brick or tile serving the purpose of through-stones.

¹ MIDDLETON, *Ancient Rome*, vol. i, p. 54.

² RIVOIRA, *Lombardic Architecture*, vol. i, p. 20.

³ *Script. Hist. Aug.*, CAPITOLINUS, *Antoninus Pius*, 10, 4; *Verus*, 2, 4; VOPISCUS, *Probus*, 2, 1. DIO CASSIUS, lxxi, 35. PUBLIUS VICTOR, *Descriptio Urbis Romae*, MIGNE, *Patr.*

Lat., vol. xviii, cols. 445, 446. URLICHS, *Codex Topographicus Urbis Romae*, pp. 14, 41. [JORDAN, *Topographie der Stadt Rom im Alterthum*, vol. ii, p. 557.]

⁴ PLINIUS, *H. N.*, xxxvi, 74.

⁵ Ambrosian Library, Milan, GRIMALDI, *Cod. A*, 178, inf., fol. 56.



IV. CLAUDIUS

WITH the great buildings of Claudius (A.D. 41-54) the 'structura testacea' (see p. 2) went out of fashion, and there came in the new vogue of the triangular brick, a shape which had two advantages over the square, unbroken form, viz. that of getting a better hold of the core, and so consolidating the wall, and also that of economy, as the outer facing was composed of only half or quarter square tiles or bricks. This check may have been due to the fact that when the most important Claudian works, the aqueducts, came to be erected



Fig. 71. The Claudian Aqueducts near Rome

there was not a sufficient supply of unused tiles, and the kilns were not yet capable of furnishing the large quantities that were required. Besides, stone was the traditional material for aqueducts. The use of the triangular brick was, perhaps, suggested by the necessity for strengthening the sides of the 'specus' or channel of the Anio Nova aqueduct, which were only 70 cm. (2 ft. 4 in.) thick, so as to counteract the considerable weight of water in the specus itself, which had a width of 1 m. (3 ft. 3 in.).

As a matter of fact, the imposing arches of the Claudian aqueduct (begun by Caligula in 38, and finished and dedicated by Claudius in 52¹), which the elder

¹ LANCIANI, *I Comentarî di Frontino*, p. 347 (*Atti della R. Accad. dei Lincei*, ser. 3, *Memorie*, vol. iv).

Pliny described as one of the wonders of the world,¹ and of the levels of which (and of the other Roman aqueducts) an accurate survey has recently been made,² were built of large squared blocks of peperino, with some small admixture of blocks of tufa (fig. 71). Upon these arches the specus of the Aqua Claudia was constructed in peperino; but not so that of the Anio Nova above it, which, for greater lightness, had its sides of concrete, faced at the top and bottom with triangular bricks mixed with broken tiles, and in the middle by a band of reticulate. This I have personally verified by walking along the top of the aqueduct for the greater part of its course between 'Le Capannelle' and the city (fig. 72).

The triangular bricks are of two sorts, made from 'laterculi bessales', about 20 cm. (8 in.) broad and very nearly 4 cm. (1½ in.) thick. The one sort were made by cutting the *bessales* diagonally before they had been fired, thus producing two

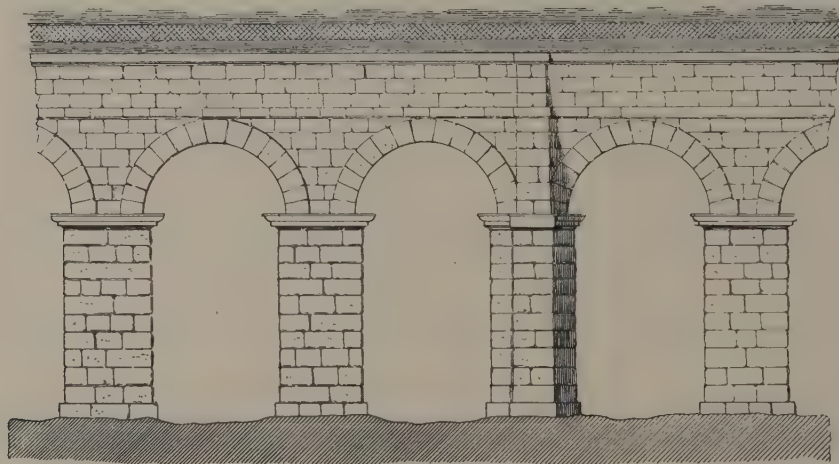


Fig. 72. Arches of the Aqua Claudia

bricks with a base measuring about 30 cm. (1 ft.). The other sort was formed from the *bessales* by two diagonal cross-cuts made with the hammer when the mason was about to use them, thus producing four bricks with a base of about 20 cm. (8 in.). We must reject the idea, started by Piranesi,³ that the division was made by the saw on baked bricks. The large number of triangular bricks (*lateres trigones*) which I have examined has convinced me that, on the contrary, they were made from unbaked bricks by cutting with a sharp blade, while the baked ones were divided with a hammer. The two-foot bricks in the large and small theatres at Taormina have a diagonal groove because they were intended to be cut before being baked, but this was not carried out: it was not to facilitate their being sawn across, as some have fancied. It may be added that not infrequently one finds triangular bricks with a knife-cut which does not go right through, completed, to save trouble, by breaking off by hand. It may seem superfluous to remark that these Roman methods of producing triangular bricks, instead of forming them in a mould, were due to economy.

¹ PLINIUS, *H. N.*, xxxvi, 122.

² REINA, CORBELLINI, DUCCI, *Livellazione degli antichi acquedotti Romani* (*Memorie della Soc. Ital. delle Scienze detta dei XL*, ser. 3,

tom. xx).

³ PIRANESI, *Le antichità Romane*, vol. iii, tav. v.



Fig. 74. Rome. Remains of the temple of
Claudius on the Caelian



Fig. 73. Nîmes. Pont du Gard

In the piers of the arches may be noticed the occurrence at intervals, for obvious reasons, of substantial stepped buttresses, at right angles to the axis of the aqueduct. Their bulk, varying between 1.30×1.50 m. (4 ft. 3 in. $\times$ 5 ft.) and 1.20×1.35 m. (3 ft. 11 in. $\times$ 4 ft. 5 in.), depends upon the height of the structure.

Judging from the other Roman aqueducts which I have examined, the imposing



Fig. 75. Segovia. Roman aqueduct

character of this work of Caligula and Claudius is surpassed only by the aqueduct at Segovia known as 'el Puente del Diablo' or the Devil's Bridge (c. 109) (fig. 75), and the 'Pont du Gard' at Nîmes (c. 150) (fig. 73).

Stone, that is to say travertine, was also used in the substructions of the platform of the temple of Claudius on the Caelian (erected by the younger Agrippina (d. 59), destroyed by Nero, and rebuilt by Vespasian¹), as may still be seen near the church of SS. Giovanni e Paolo (fig. 74). The brickwork of this platform is later than Claudius.

¹ SUTONIUS, *Vespasianus*, 9.



Fig. 76. Rome. Porta Maggiore



Fig. 77. Port of Ostia.
From a coin of Nero

in the Porta Maggiore and in the monumental arch of the Aqua Virgo in the Via del Nazzareno, erected and restored by Claudius (45-46).¹ I note that



Fig. 78. Ostia. Tomb of the time of Claudius

as is proved by his famous villa near Tivoli⁵ and his other splendid villa at Praeneste.⁶

¹ LANCIANI, *Comentarii di Frontino*, p. 337.

² DENNIS, *Cities and Cemeteries of Etruria*, vol. i, pp. 167, 168. CANINA, *L'antica Etruria Marittima*, &c., vol. ii, p. 166, tav. cxxx.

³ SUTONIUS, *Claudius*, 20.

⁴ PIRANESI, *Antichità d'Albano*, tavv. xv, xvii, xviii, xxi, xxii.

⁵ *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 26, 5.

⁶ NIBBY, *Dintorni di Roma*, vol. ii, p. 482.

In addition to the introduction of triangular bricks in walling, the age of Claudius saw the appearance of two singular motives of architectonic decoration, forerunners of that daring baroque style which, though seemingly so unbalanced, extravagant, tortured, in reality has the quality of magnificence, is rich in pictorial and spectacular effects, and, what is more important, is scientific in construction. The first is the rusticated piers carrying the high imposts both plain and moulded of arches, as in the structures belonging to the temple of Claudius and in the grand Porta Maggiore which carries the channels of the Aqua Claudia and the Anio Nova (fig. 76). The other is columns formed of blocked-out capitals, instead of drums of travertine, as may be seen in the Porta Maggiore and in the monumental arch of the Aqua Virgo in the Via del Nazzareno, erected and restored by Claudius (45-46).¹ I note that centuries before this the Etruscans had used rustic stonework in some of their underground tombs, for instance, the 'Grotta della Colonna' at Bomarzo.²

It is at this time also that mixed reticulate makes its first appearance. Thus the specus of the Anio Nova is built of bands of lozenge-work and of brick. At Ostia, too, one may see reticulate with brick quoins. For it is in the reign of Claudius, who by his works on the harbour³ (fig. 77) gave new life to Ostia, that we must date the tomb with arches of triangular bricks set in mortar, enclosing panels of reticulate which have brick bondings. This tomb is set on a substructure of the time of Agrippa, but is below the level of the buildings of the time of Hadrian (fig. 78).

Fine examples of mixed reticulate occur under Domitian in his great villa at Albano;⁴ and under Trajan at Rome in the substructures of his Thermae on the site of the Golden House, or in the warehouses which he erected at Porto (100-106). But it was most widely used under Hadrian,



V. NERO

IF the age of Nero (A.D. 54-68), as expressed in its buildings, mainly impresses us by the unbridled fancies of his many-sided artistic nature, the fact remains that it was then that the use of brick begins to be predominant in important secular buildings, and that the Roman architects deliberately set themselves to work on the solution of new problems of construction and equilibrium, and also on the creation of new conceptions in plan and elevation.

The names of the chief executants of the grandiose works commanded by the fastidious and splendour-loving emperor have been preserved. These were Severus and Celer, famous architects in the service of the palace (i.e. civil and military architects, like Vitruvius), and the subjects of high commendation by Tacitus, who is generally so sparing of praise: 'magistris et machinatoribus Severo et Celere, quibus ingenium et audacia erat etiam, quae natura denegavisset, per artem temptare et viribus principis illudere.'¹ It was they who planned and began the canal from Baiae to Ostia,² never completed owing to the death of its originator. Their principal works in Rome were: the Claudian aqueduct or 'Arcus Caelimontani', with the Nymphaeum and reservoir on the Caelian, the 'Domus Aurea', the 'Macellum Augusti', and the Thermae of Nero.

THE ARCUS CAELIMONTANI were constructed, together with the reservoir, in the year 59. They were restored and altered in 201 by Severus and Caracalla³ (fig. 79A). The imposing original arches of this branch of the Aqua Claudia consist of a core faced with courses of fine triangular bricks predominantly red in colour. Courses of large bonding tiles are inserted, but not at regular intervals, for the number of brick courses between them varies from twelve to thirty-three. The arches are formed, as a rule, of two rings of square tiles. But occasionally there are three, as, for instance, in the arches which cross the road near the Porta Maggiore. The intrados shows not only the two outer archivolts, formed of whole square tiles set radiating, alternating with three, four, five, and even six

¹ TACITUS, *Ann.*, xv, 42. ['The architects and engineers (of the Golden House) were Severus and Celer, who had the genius and audacity to try to achieve by art what nature had denied, and to play with the emperor's resources.']

² PLINIUS, *H. N.*, xiv, 61.

³ SEXTUS IULIUS FRONTINUS, *De Aquis Urbis Romae*, i, 20; ii, 76. LANCIANI, *Comentarii di Frontino*, pp. 364-74. [C. I. L., vi, 1259. DESSAU, 424.]

such tiles split in two, but also a central band made of a smaller number of whole tiles, between which runs a course of broken brick. The cavities are filled in with bits of tufa, stone, and tiles set in mortar freely applied (fig. 79 B).

This method of construction is important for the history of Roman vaulting, as it contains the principle of the resistant skeleton ribs found in actual vaults. We shall have to trace for the first time the origin and development of such skeleton ribs, as exhibited in dated buildings, supplementing and correcting Choisy's treatment of the subject when necessary.¹

We may also note in these Neronian arches the expedient of having two rings



Fig. 79A. Rome. One of the Arcus Caelimontani

of bricks, each 50 cm. (1 ft. 8 in.) broad, instead of one of 80 cm. (2 ft. 8 in.) as in the Porta Palatina at Turin. This duplication enables the arches to bear the superincumbent weight more safely, and also renders them less liable to crack in the process of settlement, or in case of an earthquake. Moreover, it allows the use of temporary centering of a less substantial and therefore more economical character, for the inner ring provides a solid centering for the one above it.

Notice also the relieving arch in the large wall surface between the arches over the road, mentioned above, and the point where it leaves the main specus of the aqueduct. This relieving arch was designed to discharge on to the points of greatest solidity the very considerable weight of masonry. For the wall in question is about 17 m. (56 ft.) high, 10 m. (33 ft.) wide, and 2.50 m. (8 ft. 3 in.) thick.

¹ CHOISY, *L'art de bâtir chez les Romains*, pp. 48-60.

THE RESERVOIR AND NYMPHAEUM on the Caelian took the place of the unfinished 'Claudium' or temple of Claudius, which was demolished by Nero, and was intended to supply the water of the lake which he made where the Coliseum now stands.¹ To these works is supposed to belong the singular eastern face of the platform of the Claudium as restored by Vespasian, with a series of tall niches and large semicircular and rectangular recesses, the central one set back between two side walls. The brickwork is evidently contemporary with that of the Domus Aurea.

THE 'DOMUS' to which Nero himself gave the title of 'AUREA' was built immediately after the great fire of Rome in 64, in which the 'Domus Transitoria' ² also perished. At the death of its creator it was still unfinished; and though Otho (69) gave orders for its completion,³ nothing was done, as the excavations have shown. This palace, a notable expression of Roman art, covered a space of more than 1½ square kilometres (370 acres⁴), and contained waterfalls,

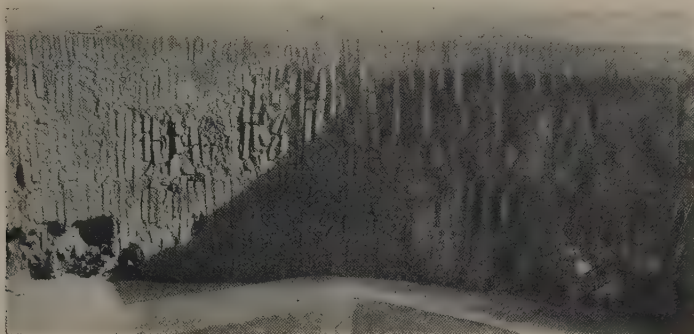


Fig. 79B. Detail of the Arcus Caelimontani

baths, lakes, fountains, fields, vineyards, pastures, and woods, all with their respective forms of life, from flocks and herds to wild animals. In the middle of the vestibule, which was enclosed on its four sides by porticoes, stood in the open air a bronze statue of the emperor, 35.50 m. (120 ft.) high. The buildings, except those of a rural character, were richly decorated with pictures (the work of a Roman artist of reputation, Fabullus or Amulius⁵), stucco-reliefs, marbles, columns with capitals of Corinthian bronze, mosaics (which, to judge by the few surviving fragments, together with those from the Palace of Domitian, anticipate and surpass the finest examples of such work to be found in Ravenna, Istria, and the East⁶), jewels, ivory, mother-of-pearl, and statues.⁷

From the portions that survive and can be seen, it appears that the structure was of the ordinary concrete with triangular brick facing, the work not being so

¹ LANCIANI, *Comentarii di Frontino*, pp. 364, 365; *Ruins and Excavations*, pp. 352, 353.

² TACITUS, *Ann.*, xv, 39, 42. SUETONIUS, *Nero*, 31.

³ SUETONIUS, *Otho*, 7.

⁴ [Hyde Park has 390 acres.]

⁵ PLINIUS, *H. N.*, xxxv, 120. [See critical notes in the Teubner text.]

⁶ RIVOIRA, *Moslem Architecture*, p. 267.

⁷ [For the Domus see *Jahrb. des k. Deutschen Arch. Inst.*, vol. xxviii (1913), pp. 127 ff., F. WEEGE, *Das Goldene Haus des Nero*.]

fine as that of the Arcus Caelimontani, which may perhaps be due to haste, or to the fact that the same degree of solidity was not requisite. There is a larger use of yellow bricks, and the large square bonding tiles, which we noticed in the aqueduct arches, are generally conspicuous by their absence.



Fig. 80. Domus Aurea. Relieving arches in wall of room
(The filling up of the recesses is the work of Trajan)

The fact that bonding at one time occurs and at another is absent from buildings of the time of Nero makes one feel how fallacious it is to base theories (as even Choisy did¹) on a systematic use of bonding in Roman work.² To take only a few instances. In the buildings of Tiberius on the Palatine we notice that large square tiles occur at intervals between every five to seventeen courses of bricks; but there is no trace of anything of the kind in the contemporary

¹ *L'art de bâtir chez les Romains*, pp. 26, 27.

² [See additional note, p. 88.]

walls of the Praetorian Camp. In the remains of the propylaea or grand approach to the *Thermae* of Titus¹ such through-courses in some parts are entirely omitted, in others they only occur between 23 and 40 brick courses. In Domitian's palace on the Palatine there are walls in which the tile-bonding courses occur between brick courses varying from 14 to 26. In the walls of Domitian's temple of Augustus they occur between every 9 to 19 brick courses, and even larger intervals. The internal walls of the Coliseum have no continuous tile-bonding courses. They are also absent from the lofty walls above ground of the Baths of Trajan, or occur only once or twice about half-way up. In the Baths of Diocletian there are walls in which similar bondings occur between brick courses at intervals of from 22 to 26, but at other times there are over 100 courses of brick without any interruption. In the Basilica Nova the brick courses between the bondings vary from 8 to 56.

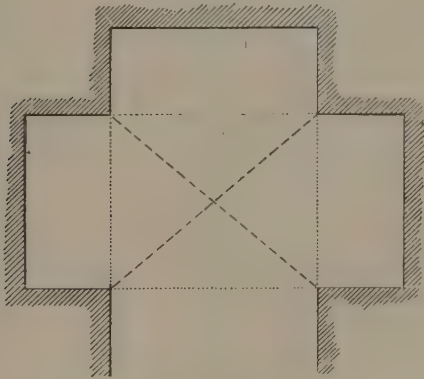


Fig. 81A. Domus Aurea. Plan of cross-vaulted room

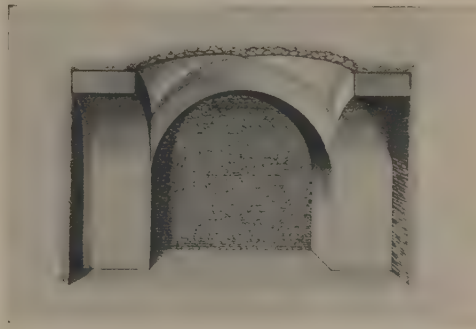


Fig. 81B. Domus Aurea. Section of cross-vaulted room

In one room of Nero's palace may be noticed a new use of the relieving arch. One wall was weakened by three recesses, and not only were these protected by relieving arches, but the weight of the wall above the recesses was diminished by the insertion high up of a series of relieving and flat arches, which discharge part of the weight on to the angles of the room, and concentrate the rest of it on the parts of the wall between the recesses (fig. 80).

Though the barrel vault is commonly used in the Domus Aurea, the cross vault is also found, and a well-preserved specimen of the latter has recently come to light on the second floor of a cruciform chamber consisting of a quadrangle of 4.50×3.70 m. ($15 \times 12\frac{1}{2}$ ft.), with four arched recesses, 1.90 m. ($6\frac{1}{4}$ ft.) and 2.40 m. (8 ft.) deep. The chamber was altered when, either by a change of plan or by Otho's order, the circular room, to be described presently, was erected (figs. 81A, 81B, 82). Given the four arched recesses and the limited height of the walls, the architect was unable to employ the barrel vault as in the other quadrangular rooms of the palace, and so had recourse to the cross vault, which had already been used in the lower story, where it has now fallen in. It is very depressed, and the groins of the four webs of the vault die out at the crown.

¹ [LANCIANI, *Ruins and Excavations*, p. 366.]

They are of concrete, spring from pointed bases, and follow the curve of the arches above the recesses, instead of being the intersection at right angles of two barrel vaults of the same height. The work is rough, and formed of tufa rubble concrete.

Until fresh discoveries are made we may regard this as the earliest developed

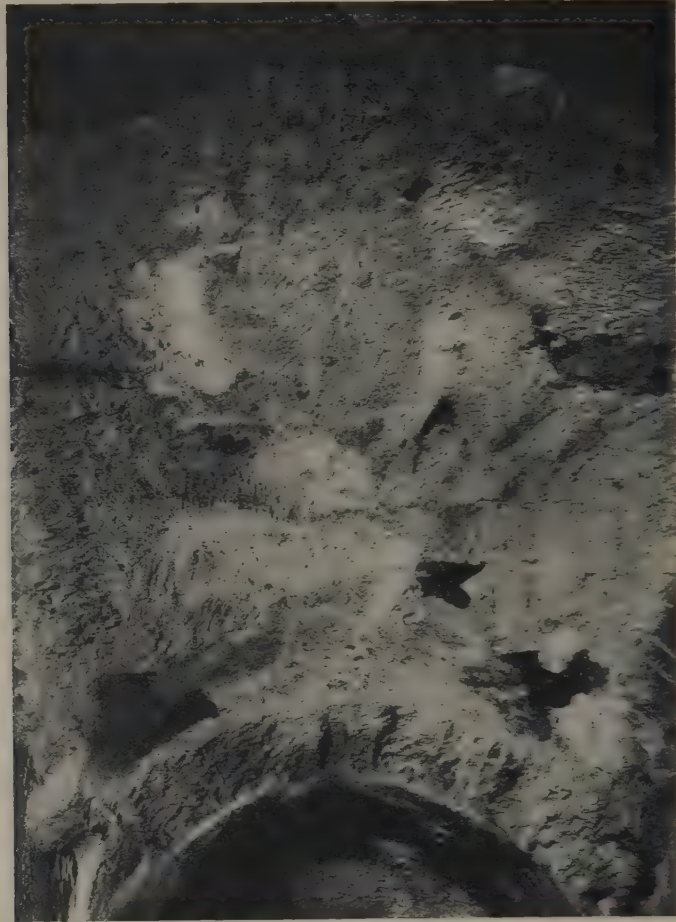


Fig. 82. Domus Aurea. Cross vault

cross vault with groins, and independent. I am aware that an older example has been pointed out in the 'Janus', the present Porta di San Lorenzo, on the Via Appia at Aquino, said to be of about 41 B.C., and perhaps earlier.¹ But the date of this cross vault, which is in hewn stone with groins, and rests like the wall-arches on angle piers, is not free from doubt. However, I will not go so far as to say that intersecting vaults and cross vaults generally were unknown to the Romans before the time of Nero.

¹ FROTHINGHAM, *Roman Cities in Northern Italy and Dalmatia*, pp. 197-9.

From the Sullan age onwards they had constructed barrel vaults over lunette spaces and ungroined quadripartite vaults (*crociere a padiglione*): what the French call 'en arc-de-cloître' or 'cloister vaults'. And from the time of Julius Caesar and Augustus they had constructed groined cross vaults. We may deal here with the first two kinds. The third will be discussed when we come to the Coliseum.

In the substructures of the porticoes of the temple of Hercules at Tivoli, the passage left for the road has a barrel vault which is met by other barrel vaults belonging to rooms at the sides, forming a series of lunettes. And at Rome in the existing open gallery on the first floor of the Tabularium, which has been the subject of some recent investigations,¹ there may be seen three specimens of the cloister vault, replastered but original, formed by four portions of raised barrel vaulting, which look like walls with a slight curve, starting from a square base, and with their re-entrant angles vanishing away at the crown (figs. 83, 84, 85). This vaulting is supported by isolated piers and half-wall piers; and at the impost has a plain continuous cornice. They are the result, not of caprice or accident, but of the necessities of construction, and the intention of avoiding the excessive thrust which a semicircular vault, of the thickness then in use, would have produced on the frontal arches. The date of this vaulting is 78 B.C. We know that in 83, when the Capitol and the temple of Jupiter lay in ruins caused by fire, Sulla formed the plan of restoring both Capitol and Forum. The temple of Jupiter, begun by him, was finished by Lutatius Catulus (78 B.C.),² who also erected the Record Office or Tabularium³ with its two stories of imposing open arcades. It is the oldest certain example known of this type of quadripartite vault derived from the square dome formed by one course projecting beyond the other, such as that of the Etruscan tomb of Poggio alla Guardia from Vetulonia (eighth-seventh century B.C.), now set up in the garden of the Archaeological Museum at Florence.⁴

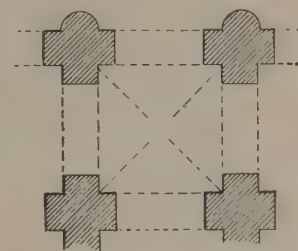


Fig. 83. Rome. Tabularium. Plan of quadripartite ungroined or cloister vault

Another specimen of an ungroined or cloister vault (which we may regard as contemporary with the kind found in the Tabularium) is to be seen in the temple of Hercules at Tivoli mentioned above. In the outer portico overlooking the Anio is a series of quadripartite vaults exactly like those of the Tabularium, in rubble concrete (fig. 86).

This type of vaulting seems to be of Etruscan origin. The Etrusco-Roman tomb known as the 'Grotta', on the Via Salaria near Frasso Sabino, which is built of large blocks of travertine without mortar, has the central square of its cruciform chamber covered by an ungroined quadripartite vault constructed of blocks set like voussoirs, parallel to the walls of the chamber.⁵ Judging by the construction of the tomb, its date must be earlier than the time of Sulla.

I would also call attention to the fact that in ancient times the quadripartite vault, whether groined or ungroined, was unknown in Chaldaea, Assyria, and

¹ DELBRUECK, *Hellenistische Bauten in Latium*, vol. i, pp. 23-46.

² TACITUS, *Hist.*, iii, 72.

³ LANCIANI, *Ruins and Excavations*, pp. 295, 296.

⁴ MILANI, vol. i, pp. 283, 284.

⁵ LORENZO FIOCCA, *Ipogeo etrusco-romano presso Frasso Sabino (Umbria)* (Perugia, 1918).

Egypt; nor, at a later time, was it employed by the Greeks or in Hellenized countries until they learned it from the Etruscans and from the Romans of the Sullan age.

It is true that the vault of a tomb at Pergamum has been adduced as a prototype. It is an imperfect quadripartite vault in blocks of hewn stone, formed by a central barrel vault intersected, but not uniformly or completely, by two lateral arches of different width and height, and is thought to belong to the Attalid epoch (241-133 B.C.)¹ (fig. 87). But this date is not supported by conclusive evidence. Besides, what a singular phenomenon this isolated example of a vault would be, without any successor in Pergamum itself, or at Sardis or Tralles or Ephesus, all of them cities which had benefited by the munificence of the Attalids² in the days before Roman methods of construction began to exercise their influence in them.



Fig. 84. Tabularium. Section of cloister vault

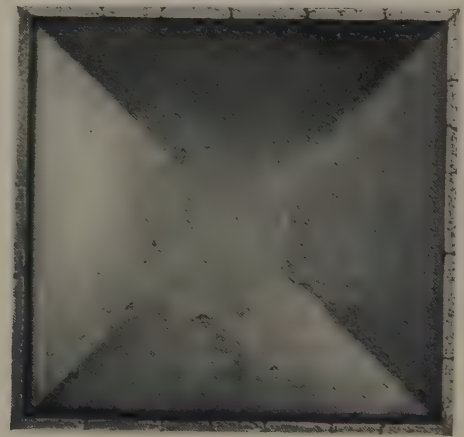


Fig. 85. Tabularium. Cloister vault

Lastly, attention must be called to the great circular room in Nero's palace, which a few years ago was partly excavated.³ It is an octagon in plan, with a diameter of nearly 4.90 m. (16 ft.). Its vault, which starts like a cloister vault from the horizontal base, develops into a spherical form by means of an irregular transformation of the concrete mass, which contains courses of tufa lumps laid by hand but in an irregular way. It terminates in a key circle with a large opening or eye framed by a ring of large square tiles. It was left rough, for the imprint of the centering boards is visible, and was one of the parts of the *Domus Aurea* left unfinished by Nero and Otho. It is the largest surviving Roman structure all in concrete, of circular form with a cloister-vault dome (*cupola a padiglione*), which is not either a temple or a tomb.

The cloister-vault dome was fairly common in Roman architecture, to judge

¹ CHOISY, *Histoire de l'Architecture*, vol. I, pp. 518, 519.

² BELOCH, *Studi di Storia antica*, fasc. v, p. 199, G. CARDINALI, *Il Regno di Pergamo*.

³ *Nuova Antologia*, 16 June 1914, pp. 655-61, A. MUÑOZ, *Un insigne monumento da salvare. La 'Domus Aurea' di Nerone*.

from the drawings of Montano (sixteenth-seventeenth century) published by Soria (1581-1651).¹

MACELLUM AUGUSTI. We are told that in 59 Nero dedicated the Provision Market mentioned by Dio Cassius.² Moreover, the reverse of an undated coin of Nero has the legend MAC. AVG., which had been universally read (though doubts have now arisen about it³) as MACELLVM AVGVSTI,⁴ a name generally connected with the 'Macellum Magnum' on the Caelian which was also known as the 'Mons Augustus'.⁵ It accompanies the representation of a round building with a cupola, having two stories of colonnades, and approached by a flight of steps. It is flanked by two porticoes also of two stories, but not uniform either in height or the number of columns.

This coin was issued in large numbers. Fig. 88 is from a cast kindly made for me by Comm. Serafini, the keeper of the Coin Room in the Vatican Library. I put beside it a reproduction of a sketch by Salvestro Peruzzi in the Uffizi at Florence,⁶ which seems to be derived from the coin, unless, indeed, it represents an ancient Roman building which has disappeared (fig. 89).

The most recent views about the building represented on the coin in question are, on the one hand, that very likely it is to be identified with the round church of Santo Stefano on the Caelian,⁷ which must have been erected on the remains of a structure of the classical period, of similar architectural form—probably Nero's Macellum—rebuilt to serve the same purpose in the course of the fourth century.⁸ The opposite view is that it does not represent a market at all, but a garden building forming part of the Domus Aurea.⁹

My own remarks on Santo Stefano Rotondo (figs. 90, 91) shall be brief.

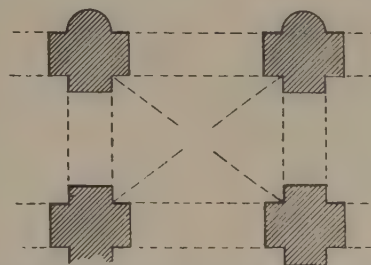


Fig. 86. Tivoli. Temple of Hercules
Plan of vault in outer portico

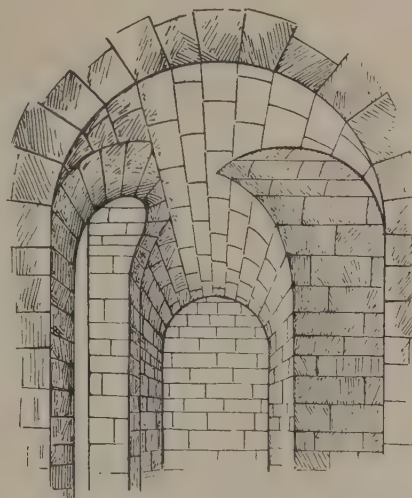


Fig. 87. Pergamum. Interior of tomb

¹ MONTANO, *Scielta de varii tempietti antichi*, tavv. 3, 42; *Raccolta de tempj, e sepolcri disegnati dall' antico*, tavv. 13, 38, 43 (Roma, Stamperia De Rossi).

² DIO CASSIUS, lxi, 18.

³ PROFUMO, *Le fonti ed i tempi dello incendio neroniano*, pp. 673-93.

⁴ COHEN, *Description historique des monnaies frappées sous l'Empire Romain* (2nd ed.), vol. i, p. 288. DONALDSON, *Architectura Numismatica*, pp. 267-9. [MATTINGLY, *Coins of the Roman*

Empire in the British Museum, vol. i (London, 1923), pp. clxxix, 236, no. 191.]

⁵ TACITUS, *Ann.*, iv, 64.

⁶ N. FERRI, *Indice geografico-analitico dei disegni di Architettura civile e militare esistenti nella R. Galleria degli Uffizi in Firenze*, n. 683, p. 200.

⁷ JORDAN, HUELSEN, *Topographie*, vol. i³, pp. 237, 238.

⁸ LANCIANI, *Ruins and Excavations*, pp. 355-9.

⁹ PROFUMO, *op. cit.*, pp. 673-93.

I discussed the building in a previous work,¹ but I have since made a fresh examination of it. My points are these.

1. Nothing that survives above ground shows the remotest indication of work of the time of Nero, and I was able to verify this when the last restoration of the roof of the drum was in progress.



Fig. 88. Coin of Nero. 'Macellum Augusti'

2. The building was not erected for Christian worship: ² on the contrary it was a secular building, apparently a great market-house dating from the second half of the fourth century, perhaps burned when Alaric's hordes sacked Rome (410) ('Urbem capiunt, devastant, incendunt'), or more likely damaged in the terrible earthquake of 442 ('tam terribili Roma terremotu concussa est ut primae eius aedes aedificiaque corruerint' ³), and afterwards restored and altered by Pope Simplicius (468-483), who consecrated it for Christian worship and dedicated it in honour of the martyr Stephen of Jerusalem.⁴

3. Above the central colonnade with its architrave (the 'tholus macelli') the elevated drum, carried on columns which like the bases of the capitals have been brought from elsewhere, shows by its inferior brickwork, some of the bricks being re-used ones, without tile-bonding courses, and with wide mortar joints, that it is later than the age of Constantine. The drum never supported a dome of masonry, for it is barely 90 cm. (3 ft.) thick, and the three transverse arches inserted to strengthen it may be ascribed to Hadrian I (772-795), who carried out considerable works of restoration in the building.⁵



Fig. 89. Sketch by Salvestro Peruzzi 'Macellum Magnum'?

There is nothing surprising in the use of materials taken from older buildings. People did not wait for the edicts which abolished the pagan worship and allowed the destruction of the temples in which it was celebrated, in order to begin to rob ancient buildings. A proof of this is the mausoleum known as that of Santa Costanza,⁶ which, as I believe, was erected by Constantine for himself between 324 and 326 (see p. 241).

4. In the outer colonnade, originally open and enclosed by an outer wall but later built up, the columns, all brought from other buildings, have pulvins (or impost blocks, whatever you like to call them), and this indicates the work of Pope Simplicius. The Ravennate or

Campanian pulvin made its first appearance in the old Basilica Ursiana at Ravenna (370-384) and in San Giorgio Maggiore at Naples (367-c. 386). Cushions

¹ RIVOIRA, *Lombardic Architecture*, vol. i, p. 12.

² DE ROSSI, *Mosaici cristiani*, vol. ii, Abside della chiesa di S. Stefano Rotondo.

³ *Istituto Storico Italiano; Fonti della Storia d'Italia*, PAULUS DIACONUS, *Historia Romana*,

pp. 171, 178. *Mon. Germ. Hist., Chronica minora saec. IV-VII*, i, 301.

⁴ DUCHESNE, *Le Liber Pontificalis*, vol. i, p. 249.

⁵ *Ibid.*, p. 510.

⁶ RIVOIRA, *Lombardic Architecture*, vol. i, p. 204.

of this kind were not to be seen in Rome till the time of Leo the Great (440-461), as is shown by Santo Stefano on the Via Latina;¹ and that is why they were not used for the supports of the drum of Santo Stefano Rotondo, the circular building we have been discussing.

THE 'THERMAE NERONIANAE' OR BATHS OF NERO were dedicated in the year 63,² and were rebuilt by Alexander Severus (222-235).³ We know nothing about their plan. It is only stated that they contained a *lavacrum* and a *palaestra*;⁴ and according to Martial they were among the best: 'Quid Nerone peius? Quid thermis melius Neronianis?'⁵ This commendation of the latter department seems to have been due, over and above the wealth of decoration, to the increase of space (larger than in the earlier establishments) allotted to bodily exercises; and this would explain the supply of oil mentioned by Suetonius⁶



Fig. 90. Rome. S. Stefano Rotondo. Exterior

and Tacitus.⁷ It may also have been a tribute to the excellent lighting of the rooms, a characteristic which the younger Seneca (2-66) mentions in the baths of his own day as compared with those of earlier date.⁸ In fact Dio Cassius uses the term *balanceion* of the Thermae of Agrippa rebuilt by Hadrian, and the Thermae of Titus, the plans of which as they have come down to us do not suggest a great extension of the palaestra; whereas he applies the name of *gymnasion* to the Thermae of Nero, which he saw before they were rebuilt by Alexander Severus, and to those of Trajan, the plan of which includes a large space devoted to exercise.⁹

¹ RIVOIRA, op. cit., vol. i, pp. 10, 18; Moslem Architecture, pp. 109, 274. FORTUNATI, *Brevi cenni intorno allo scoprimento della Basilica del primo martire della Chiesa S. Stefano*.

² TACITUS, *Ann.*, xiv, 47. SUETONIUS, *Nero*, 12. MIGNE, *Patr. Lat.*, vol. xxvii, col. 454. HIERONYMUS, *Eusebii Chronica*. [FOTHERINGHAM, *Eusebii Chronici Canones Latine vertit Hieronymus* (London, 1923), p. 265.]

³ *Script. Hist. Aug.*, LAMPRIDIUS, *Alexander Severus*, 25, 3.

⁴ SUETONIUS, *Nero*, 12.

⁵ MARTIALIS, *Epigr.*, vii, 34.

⁶ *Nero*, 12.

⁷ *Ann.*, xiv, 47.

⁸ L. ANNAEUS SENECA, *Epistolae morales*, 86.

⁹ DIO CASSIUS, liv, 29; lxi, 21; lxvi, 25; lxi, 4.

Moreover, Suetonius, while mentioning only baths in his account of the *Thermae* of Titus ('*amphiteatro dedicato thermisque iuxta celeriter exstructis*'), in the case of Nero's *Thermae* refers to the gymnasium as well ('*dedicatisque thermis atque gymnasio*').¹ Hence we shall not be far wrong if we infer that Severus and Celer provided the first example of complete Roman *Thermae*, which afterwards grew till they reached the dimensions of those of Caracalla and Diocletian.



Fig. 91. S. Stefano Rotondo. Interior

In concluding our account of the age of Nero we must notice that brick-faced concrete construction, as used in large buildings, remained essentially the same throughout the Imperial epoch, in spite of variety in the kinds of bricks used in the facings, and though consolidation by bonding courses of large tiles was not invariable.

Roman concrete construction, being free from the rigidity, laborious execution, and costliness of Greek masonry, was easily handled, elastic, carried out with mortar of extreme durability, adaptable to every variety of plan and every form of roof, not to speak of its being inexpensive and capable of rapid execution. Combined with the arch and the vault, which the architects of Rome had made supreme in their art, it led them step by step, aided by their own experience and that of other races, to the creation of the most elaborate, scientific, and original vaulted buildings of the ancient world. And the forms in which these

¹ *Nero*, 12; *Titus*, 7.

reached their culmination were the Roman *thermae* and tombs; for it was in secular, not sacred, architecture that the Roman architects attained their highest distinction.

Our task is to trace the progressive structural and statical development of this creation. But before proceeding further, I would ask who were the persons chiefly responsible for it.

Considering that the most important examples are to be found in the Imperial palaces and sepulchres, the basilicas, *thermae*, and other edifices intended for public use, the erection of all of which was entrusted to contractors paid either by the state treasury or by the emperor's privy purse, or by both, under the direct supervision of the state officials, we shall not be far wrong if we ascribe the origin of these works to state architects attached to the departments of roads, aqueducts, and military constructions.

Our information about the nationality of the architects of the great Roman state buildings of the Imperial age is very scanty, because the Romans held that the credit for the public buildings designed by the architects ought to belong to the state; and so strongly did they hold this that they were forbidden to inscribe their names on them. The subject requires to be studied afresh. It must be emancipated from the prejudice and passion for things Greek which many writers carry so far, refusing to accept any but Greek architects, either real or hypothetical, or else genuine Roman architects whom they have sent off as occasion demanded to learn Greek fashions and unlearn Roman ones in Hellenic lands. This attitude hinders rather than promotes a sincere and unprejudiced study of the ancient architecture of Italy. The fact is, the Greeks, with their determination to see the traces of their own genius everywhere, took good care to hand down to posterity the names and to extol the achievements of their own architects, while preserving an invidious silence about those who belonged to the Latin world.

Thus it was Cossutius himself who recorded the fact that he was the architect of the temple of Olympian Zeus in the well-known inscription discovered at Athens in the middle of the eighteenth century; and Vitruvius mentions him in his treatise.¹ No Greek writer says a word about him. And if Dio Cassius, a resident of long standing in Rome, does refer to Hadrian as making the designs for the temple of Venus and Roma, his object is detraction of the emperor through the unfavourable criticisms of Apollodorus. And while he records all the buildings in Rome of which the latter was the author, he names but one by the emperor-architect; and that was the splendid Basilica of Trajan's Forum, which had the name of its author inscribed upon it.

Among the writers who are unfavourable to the idea of Latin architects, and who might have found something to learn from various remarks of Piranesi² and Carlo Fontana,³ some have plenty of erudition, only it is not supplemented by that wide, personal, and practical knowledge which is indispensable, nor is it accompanied by a correct appreciation of Roman buildings. And the value of their erudition is considerably weakened by the following faults.

They go astray through fanciful ideas (based on phil-Hellenic prejudices) about

¹ [*Inscriptiones Graecae (Corpus Inscr. Atticarum)*, iii, 561 (= *C. I. G.*, 363). VITRUVIUS, vii, praef. 15.]

(Rome, 1761).

³ *Templum Vaticanum et ipsius origo* (Rome, 1694), p. 3.

² *Della magnificenza ed architettura dei Romani*

the significance and value of Roman names ; even when it is quite unnecessary, and without reflecting whether the works of those who bear the names correspond or not to the habitual methods or fashions, the tastes, and the traditions of the race to which they belonged. A matter this of immense importance, for architecture receives the impress of the character and of the needs of any people capable of producing a style.

They look at the architect solely in his character of artist and exponent of aesthetics, forgetting the technical and engineering sides of his activity.

They give the word 'Architecture' the one-sided meaning of aesthetic and artistic design and execution, with a liberal use of sculpture, painting, and the minor arts as its auxiliaries. But while it is true that architecture makes use of the arts, it is also a science ; and it is science pure and simple when vault-construction is concerned.¹ It was as a science that Vitruvius regarded it : 'Architecti est scientia pluribus disciplinis et variis eruditionibus ornata.'²

They regard Roman vaulted buildings only from the point of view of mass and solidity, and neglect the question of equilibrium ; forgetting that vault-construction is the most difficult part in the actual mechanics of architecture, and that these buildings were the ancestors of the great vaulted architecture of the Byzantine and Lombardic or Romanesque epochs, as well as of that of the Pointed style and of the Renaissance.

They forget that when the Roman Empire came into existence Greek architecture had already lived its life, had become fixed in a restricted number of types, and was governed by rigid rules, variety being obtained merely by external decorations. This was a striking defect in the Greeks, so much so that when in after times they borrowed from the Romans the vaulted and domed church of central plan,³ that idea became ineradicable and fossilized, and to this day they have never emancipated themselves from this stagnation of church planning.

They do not reflect that, from Hadrian onwards, the greatest architects have won their laurels with vaulted buildings ; and that their peculiar merit consists in daring, scientific construction, and skill in calculating resistance, rather than in their decorative invention. The Pantheon was surely the culminating creation of the emperor-architect, Hadrian. The grandiose, daring, unprecedented dome of Santa Maria del Fiore at Florence was Brunelleschi's outstanding achievement. Who can doubt that the crowning effort of Michelangelo was the colossal dome of St. Peter's ?

What class of men the state architects of Rome were we learn from Vitruvius. They were military engineers, who accompanied the legions in the field, and at the same time civil architects.⁴ We further gather from him that Rome in the past as well as in times near to his own possessed distinguished architects no less than the Greeks. Among these are mentioned : Cossutius, chosen by Antiochus Epiphanes (175-164 B.C.) to erect in Athens the colossal temple of Olympian Zeus, the foundation of which had been laid by Pisistratus (d. about 527 B.C.). The death of the Syrian king left the temple unfinished, and it was completed

¹ *Atti e Memorie della R. Accademia di S. Luca ; Annuario 1913-1914*, pp. 25-31, RIVOIRA, *Roma, l'Italia nella creazione delle antiche architetture a volta*.

² VITRUVIUS, I, i, 1.

³ RIVOIRA, *Moslem Architecture*, pp. 188-9 ; *Lombardic Architecture*, vol. i, pp. 66, 68.

⁴ VITRUVIUS, i, praef.

by Hadrian.¹ Another name is that of Gaius Mucius, who had designed with great skill and knowledge the temple of Honour and Virtue at Rome.²

With regard to Cossutius, 'a citizen of Rome', as Vitruvius calls him, I notice that it has been said that he was of freedman origin, or else a dependant of some Roman of plebeian stock, being a Greek by birth and not brought up at Rome.³ But, on the other hand, Vitruvius, who ought to know the facts of that age better than the hypercritical writers of to-day, says that the architects whom in the past the Romans employed had to be, above all, of good birth, and, in the second place, of sound training ('itaque maiores primum a genere probatis operam tradebant architectis, deinde quaerebant si honeste essent educati'),⁴ and the remains of the Olympian temple certainly throw no light on the question where its architect was educated.

In the ranks of the distinguished body thus formed we must include Vitruvius himself, whose design for the Basilica of Fano (Colonia Iulia Fanestris)⁵ reveals, as Choisy says,⁶ and I agree with him, talent of an exceptional kind. The merit of Vitruvius as an architect is overlooked by most people, occupied as they are

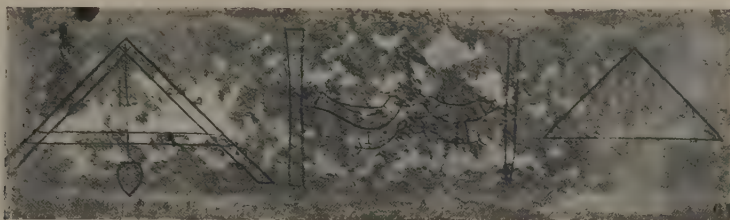


Fig. 92. Grave slab. Rome, Museo Nazionale (No. 67675)

with criticizing him as a writer. They forget the value set on the 'De Architectura' by the writers of ancient times, and from the Renaissance onwards by popularizers, commentators, and translators.

The basilica which he erected at Fano with its two stories (following the usual contemporary design,⁷ itself of Roman origin⁸) exhibited the interesting feature of the use of monolith columns (as against two tiers of columns), quite 14.80 m. (50 ft.) high including the capitals, and 1.48 m. (4 ft. 10 in.) in diameter, provided with pilasters intended to carry the cross-beams of the gallery floors and also of the ceiling. As a comment on this peculiarity I note that these columns of the basilica of Fano with engaged half-piers were the predecessors (though with a different purpose) by more than a thousand years of the great columns with engaged half-columns or piers to which I have called attention in the abbey church of Saint Philibert at Tournus (eleventh century) and in Winchester Cathedral (eleventh century).⁹

It appears to me that it was to this body of architectural and mechanical

¹ E. A. GARDNER, *Ancient Athens*, pp. 486-8.

² VITRUVIUS, vii, praef. 17.

³ *Memorie della R. Accademia delle Scienze di Torino*, ser. ii, vol. xxvii, pp. 163-9, PROMIS, *Gli Architetti e l'Architettura presso i Romani*. [DELBRUECK, *Hellenistische Bauten in Latium*, vol. ii, p. 179.]

⁴ VITRUVIUS, vi, praef. 6.

⁵ VITRUVIUS, V, i, 6.

⁶ *Vitruve*, vol. i, pp. 186-8.

⁷ VITRUVIUS, V, i, 5.

⁸ RIVOIRA, *Lombardic Architecture*, vol. ii, p. 30; *Moslem Architecture*, p. 15.

⁹ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 112-14, 206-8.

engineers, all Roman citizens, that were entrusted: siege works, with the manufacture and repair of the engines of war; laying out and constructing camps whether temporary or permanent, roads, earthworks, bridges, gates, and drains; the erection of market-places (fora), temples, basilicas, the Imperial palaces and tombs, the public theatres, amphitheatres, and circuses, the public baths, &c. These architectural and mechanical engineers were for the most part Italians, not Greeks. Thus, when Vitruvius enumerates his colleagues appointed by Augustus for military operations, he mentions M. Aurelius, P. Minidius, and Gn. Cornelius, all Latin names.¹

Nor is there any reason to believe that nearly all of them were trained at Athens, as more than one writer asserts. Vitruvius does not say a word about it when he describes the course to be taken by youths who aspire to the difficult profession of architecture;² and when he tells us how he learnt his own art, he never says that his parents sent him to Athens to acquire it.³

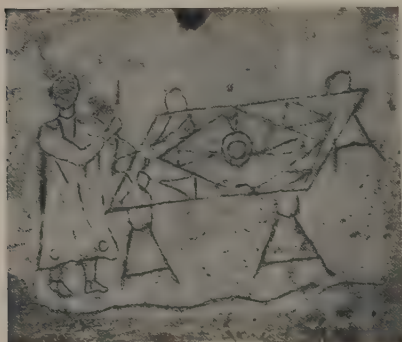


Fig. 93. Grave slab. Rome, Museo Nazionale (No. 67723)

The fact is, the architectural styles of the two peoples even in the time of Augustus (29 B. C.—A. D. 14), on the eve of the appearance of the Roman system of monumental construction based on masses of brick and concrete, were fundamentally distinct. Greek and Hellenistic architecture, with its interdependence of the constructive organism and the architectonic decoration, was eminently artistic and decorative like the Greek temperament and Greek education. Roman architecture, in which construction is not only the essence, but is also independent of the decoration, was above all things practical, simple, orderly, dignified, majestic, vast in its conceptions, solid, made for eternity; in a word the expression of the Roman character and Roman power.

Besides, what could these state architects acquire at Athens for their wide requirements except delicacy of form, a matter to which they gave scant consideration; or else the grace and elegance of the arts which are complementary to architecture, but in which, with the exception of mosaic, the Romans never excelled?

These architects, after learning their profession at home, when they followed the eagles with which the Romans carried war and peace to so large a part of the ancient world, had an opportunity of observing with a trained eye so many and such various buildings, and of gathering from them such a number of useful and practical lessons (and we know how peculiarly apt the Romans were to avail themselves of whatever they found useful among other peoples), that they had no need to begin by going to this or that foreign school for instruction and inspiration.

Any one who follows out, as I have done, the creation of a garrison town built on a regular plan, such as Aosta, portions of whose towered enceinte (25–23 B. C.) measuring 724 × 527 m. (804 × 585 yds.) are well preserved; the monumental Porta Praetoria with its exercising ground still partly in existence; the fairly well-preserved triumphal arch; the imposing ruins of the theatre; the remains

¹ VITRUVIUS, i, praef. 2.

² VITRUVIUS, I, i.

³ VITRUVIUS, vi, praef. 4.

of the amphitheatre, and of what is thought to be a granary (*horreum*¹), but is more probably a reservoir;² the vestiges of two temples; and the scientific distribution of the street sewers following the course of the main roads, will be able to gain some idea of the functions of these officers.

Moreover, he will realize that the man who planned this Augustan city was clearly an Italian belonging to the Roman school. The Greeks were not capable of such a task. As Leroux puts it: whatever the genius of Greek architects may have been, monumental compositions on a great scale, conceived and realized at one stroke on a geometrical and undeviating plan, were not in their line.³ Its virile, sober, severe architecture is essentially Roman, with an element of Etruscan



Fig. 94. Builders at work. Painting in the crypt of Trebius Justus
Via Latina

influence. The Porta Praetoria is thoroughly Romano-Etruscan. Roman is the theatre with its massive buttresses (fig. 35), the equivalent, so far as effect goes, of the tiers of half-columns which at earlier dates were attached to the exteriors of the Circus Flaminius (221 B.C.), the theatre of Pompeius (55 B.C.), and the amphitheatre of Statilius Taurus (30 B.C.) at Rome. Roman, again, is the amphitheatre with exactly similar external treatment. And the same may be said of the massive depressed arches and the concrete continuous barrel-vaults of the military storehouse, which perhaps we ought to call the reservoir. And though with Etruscan and Roman motives of ornament there are mingled others of Greek origin—and may not Greece in its turn have borrowed them from Egypt or Syria or Chaldaea?—these were intelligently assimilated by the Roman style, and rationally connected with the essential features of the construction.

¹ C. PROMIS, *Le antichità di Aosta*, pp. 156-64.

² HAVERFIELD, *Ancient Town Planning*, pp. 89-91.

³ E. LEROUX, *Les origines de l'édifice hypostyle en Grèce, en Orient et chez les Romains*, p. 251.

This is not to say that experienced Greek architects did not come to Rome, or were invited there, or did not come to offer themselves for the execution of important works of public utility and ornament. I say 'experienced', because from the time of Augustus onwards the number of practitioners of that grand profession, worthy or unworthy, was so large that Vitruvius writes with bitter sarcasm that no one any longer took the trouble to work at shoe-making, or dyeing, or any of the easier trades, but only to be an architect.¹ To mention only those engaged on works of importance, we hear, for instance, of Saurus and Batrachus from Sparta—sculptor-architects, for Pliny includes them in his list of sculptors—who carried out the Porticus of Octavia with its temples (32 B. C.);² and the famous Apollodorus of Damascus, who was invited to Rome by Trajan to be the architect of his Forum and Thermae.

We may conclude this brief sketch by calling attention to two interesting Christian grave-slabs from the Catacombs, formerly in the Kircherian Museum, and now in the Terme Museum (nos. 67675, 67723). On the first are engraved, besides two symbolical doves, a pair of chisels, a triangular level with plumb-line, and a square, alluding to the profession of architect³ (fig. 92). The other shows a man in a long tunic holding a stylus in his right hand and a drawing-board with a geometrical design sketched on it: a scene which may refer either to an architect or a marble worker (fig. 93).

I have added the reproduction of a realistic picture, illustrating the work of the architect-builder, where the process of erecting a building may be observed. It was found in the sepulchral vault of Trebius Justus on the Via Latina, and may belong to the third century.⁴ In the upper part on scaffolds, one inside, the other out, two bricklayers with trowels in their right hands are engaged in building a length of wall. Below, a workman is climbing a ladder carrying on his shoulder a hod full of mortar, which another man is mixing with his spade. Another labourer is hurrying after him with a basket full of bricks, a pile of which may be seen on the left (fig. 94).

¹ VITRUVIUS, vi, praef. 7.

² DIO CASSIUS, xlix, 43. PLINIUS, H. N. xxxvi, 42.

³ [For other examples see H. STUART JONES, *Catalogue of the Museo Capitolino*, pp. 73-7.]

⁴ *Nuovo Bulletino di Archeologia cristiana*, vol. xvii (1911), 209-35, tavv. ix-xv; xviii (1912), pp. 83-99. MARUCCHI, *L'ipogeo sepolcrale di Trebio Giusto*.

Additional note (see p. 74). [That bonding only began under Domitian is maintained by Miss Van Deman in *American Journal of Archaeology*, 1924, p. 392.]



VI. THE FLAVIAN EMPERORS

THE age of the Flavians (A.D. 69–86) has characteristics of its own, and stands out by the imposing scale of its buildings, which also show notable innovations both in plan and structure. It was a time when artists had no need to wait for the advent of Trajan in order to recover from the depression and humiliation to which Winckelmann arbitrarily consigned them.¹

The principal works of the dynasty in Rome are : the Flavian Amphitheatre (the Coliseum), the Thermae of Titus, the Palace of Domitian, the House of Augustus, and the temple of the deified Augustus.

We have no information about the architects of the two first ; but we know about the one who was employed by Domitian after he became emperor. This was Rabirius, whose feeling for grandeur and originality gives good grounds for thinking that he must have been previously in the service of Vespasian and Titus.

The poet Martial did not stint his praise :

Astra polumque pia cepisti mente, Rabiri,
Parrhasiam mira qui struis arte domum.
Phidiaco si digna Iovi dare templa parabit,
Has petet a nostro Pisa Tonante manus.²

Promis, being unable to make out that this distinguished, vigorous Latin architect was a Greek, says that the eulogy of the great satirist was paid for.³ As we examine Domitian's palace, the 'Domus Augustana', and the temple of the Divus Augustus, all of them his creations, we shall see what to think of this baseless slander.

THE FLAVIAN AMPHITHEATRE OR COLISEUM (fig. 95). It is a common practice to denounce the establishment of public structures of this kind, which, like the thermae, were very popular with the Romans, and to contrast Roman brutality with the artistic and refining influences of Greek education. But we have to

¹ *Storia delle arti del disegno* (Rome, 1783), vol. ii, p. 369.

² MARTIALIS, *Epigr.*, vii, 56. [An anonymous old English version given in *The Epigrams of Martial*, Bohn's Classical Library, p. 331, runs :

Rabirius modell tooke from heav'n to build

Our wondrous pallace sure ; hee is so skill'd.
For Phidian Jove a worthy fane to reare,
Pisa must begg him of our Thunderer.]

³ *Memorie della R. Accademia delle scienze di Torino*, ser. ii, vol. xxvii, C. PROMIS, *Gli Architeti e l'Architettura presso i Romani*, pp. 119, 120.



Fig. 95. Rome. The Coliseum



Fig. 96. Pompeii. The Amphitheatre

imagine ourselves living in those times, and to remember that, in the age when the Greeks were a people of refinement, the Romans were a nation of soldiers and conquerors.

The amphitheatre originated in Campania. The earliest examples in masonry are : (1) the amphitheatre of Pompeii, erected soon after the settlement of Sulla's colony (80 B.C.),¹ and so far the oldest dated specimen on record (fig. 96) ; (2) the recently discovered or second amphitheatre of Pozzuoli,² for the wealthy and powerful city had two, the larger one being of Flavian date. The former was already in existence under Augustus,³ and the use of reticulate dates it in the time of the first emperor, or at earliest in that of Pompeius.

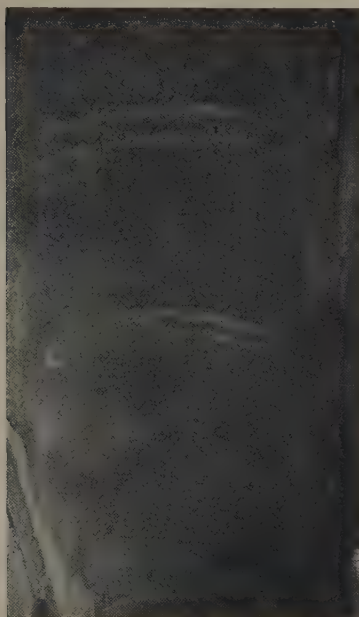


Fig. 97. Coliseum. Barrel vault
on ground floor

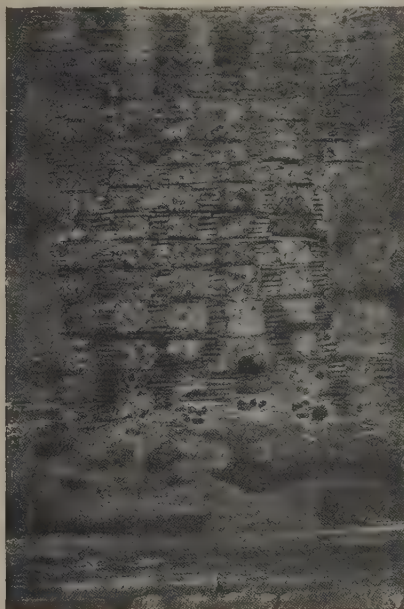


Fig. 98. Coliseum. Barrel vault
on first floor

In Rome the first amphitheatre was put up by Curio in 46 B.C., but it was of wood.⁴ Statilius Taurus was the first to build one of stone in the Campus Martius (30 B.C.).⁵ They then became all at once the fashion. Amphitheatres, for instance, formed part of the original lay-out of the Augustan cities of Turin (about 28 B.C.) and Aosta (25-23 B.C.) ; and they spread all over the Empire. The largest and grandest, as befitted the capital, was the Flavian Amphitheatre built by Vespasian (69-79), and dedicated by Titus in the year 80.⁶

To make certain about the facts, I have made a fresh examination of the

¹ FIORELLI, *Descrizione di Pompeii*, pp. 56, 57, 69-74.

² *Notizie degli scavi*, vol. xii (1915), pp. 409-15, SPINAZZOLA, Pozzuoli, *Rovine di un secondo anfiteatro*.

³ SÜETONIUS, *Augustus*, 44.

⁴ PLINIUS, *H. N.*, xxxvi, 117.

⁵ DIO CASSIUS, li, 23.

⁶ *Ibid.*, lxvi, 25. SÜETONIUS, *Vespasianus*, 9.

huge structure, paying special attention to the injuries which it is known to have suffered in ancient times, and the repairs, neither few nor superficial, which it has undergone.¹ The details to which special attention must be called as bearing on our subject are as follows.

(1) The brick vault-ribs (*nervature*). We saw this device first appearing in the 'Arcus Caelimontani'. In the Coliseum we find it not only in the frontal arches of the secondary vaults, but also applied in a new way in the great annular barrel-vaults of the galleries. Thus, in the great corridor on the ground floor, the barrel-vault in rubble concrete (judging from the parts where the plaster has disappeared) is provided at frequent intervals with transverse bands or arches consisting of two rough rings of bricks with converging joints, bonded together from point to point with large tiles 2 ft. square (fig. 97). These are the oldest simple box-ribs (*nervature a cassetta*) (derived from the Etruscan compartmented roof) that I know of,



Fig. 99. Coliseum. Barrel vault of main entrance



Fig. 100. Coliseum. Composite capital

and they provided the model for their later use in cross-vaults and domes. In the next place, in the principal gallery of the first floor the semicircular vault, where bare of roughcast and not repaired, exhibits a sort of brick lattice-work formed of longitudinal chains of brick intersected by transverse rings of large tiles. The interstices are filled in with bits of tufa and broken tiles (fig. 98).

(2) In the concrete walls (faced with triangular bricks without horizontal bonding courses of tiles), which carry the flights of stairs, raking relieving arches occur. Their purpose is to throw the weight of the stairs on to the points of greatest resistance in the walls on which they rest. And in the brick end-walls pairs of large tiles are used (instead of single ones, as in older work) with bricks between them.

(3) In the barrel-vaults of the main entrance facing the temple of Venus and

¹ NIBBY, *Del Foro Romano, della Via Sacra, dell' Anfiteatro Flavio e de' luoghi adiacenti*,

pp. 220-45. LANCIANI, *Ruins and Excavations*, pp. 369-85.

Roma should be noticed the use of permanent centering consisting, where original, of large square tiles laid horizontally, partly bonded into the concrete by the help of bricks here and there, set edgewise (fig. 99). This expedient was designed to create a rigid skeleton, a foundation or surface carrying the weight of the masonry above and forming an integral part of it, so as to make the temporary centering as expeditious and light as possible. Afterwards it was largely used in Roman construction, either in a simple form, or in that of two courses one above the other, one being of large and the other of small tiles, or both of either sort. From it originated the 'Volterranean' form of ceiling, in which bricks are set flat instead of edgewise.

(4) In the Coliseum a new form of capital, the Composite, was used. I have discussed this Roman invention elsewhere,¹ but I may repeat here the following points. It was not known in the time of Vitruvius.² It appears in the Coliseum in its earliest and simple form, beset with smooth leaves between which cauliculi sprout, while the volutes are regular disks, and the flower on the abacus is represented by an ovolo (fig. 100). Later it is seen in its complete and enriched form on the neighbouring Arch of Titus (erected after his death³) (fig. 101), and in the palace of Domitian on the Palatine.

(5) The smaller corridor on the first floor, and those of the second and third, have fine continuous groined cross-vaulting, constructed in tufa rubble concrete, much of which is still intact (fig. 102). It is astonishing that Choisy should have stated that the Coliseum contains a very small amount of such vaulting.⁴

On the other hand, the passage interposed between the first and second floors has an annular barrel-vault pierced at intervals and at different depths by arches and splayed windows.



Fig. 101. Rome. Arch of Titus
Composite capital

Cross-vaulted galleries had been seen before this at Rome in the Saepta Julia, planned by Julius Caesar, finished by Agrippa in 27 B.C., restored first by Domitian after the fire under Titus in 80,⁵ and then entirely rebuilt by Hadrian.⁶ As is well known, a principal part of this magnificent edifice was represented by the 'porticus' of eight rows of isolated piers, both simple and compound, which ran parallel to the ancient Via Lata, the present Corso Umberto I.⁷

A view by Piranesi shows some of the rows, with rectangular piers of stone blocks, each surmounted by an abacus of a fillet and cyma-recta profile, on which rest the springs of the vaulting (fig. 103). These piers still exist in the cellars of the Palazzo Doria Pamphili.⁸ Moreover, Huelsen discovered, on the ground floor of the side of the palace which looks on to the Vicolo Doria, four intermediate piers of the porticus with their capitals, in travertine. Each side measured 1.70 m. (5½ ft.), and they stood 4 m. (13 ft.) apart on the line of north and south, and

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 141, 142; *Moslem Architecture*, p. 45.

² VITRUVIUS, III, v; IV, i, 3, 7.

³ DE RUGGIERO, *Il Foro Romano*, pp. 448-54.

⁴ CHOISY, *L'art de bâtir chez les Romains*, p. 71.

⁵ DIO CASSIUS, liii, 23; lxvi, 24. *Chronica*

Minora, pp. 116-17.

⁶ SPARTIANUS, *Hadrianus*, i, 19.

⁷ JORDAN, HUELSEN, *Topographie*, vol. i³, p. 560 and pl. x.

⁸ PIRANESI, *Antichità Romane*, vol. iv, tav. xlvii; *Il Campo Marzio*, tav. xxv.

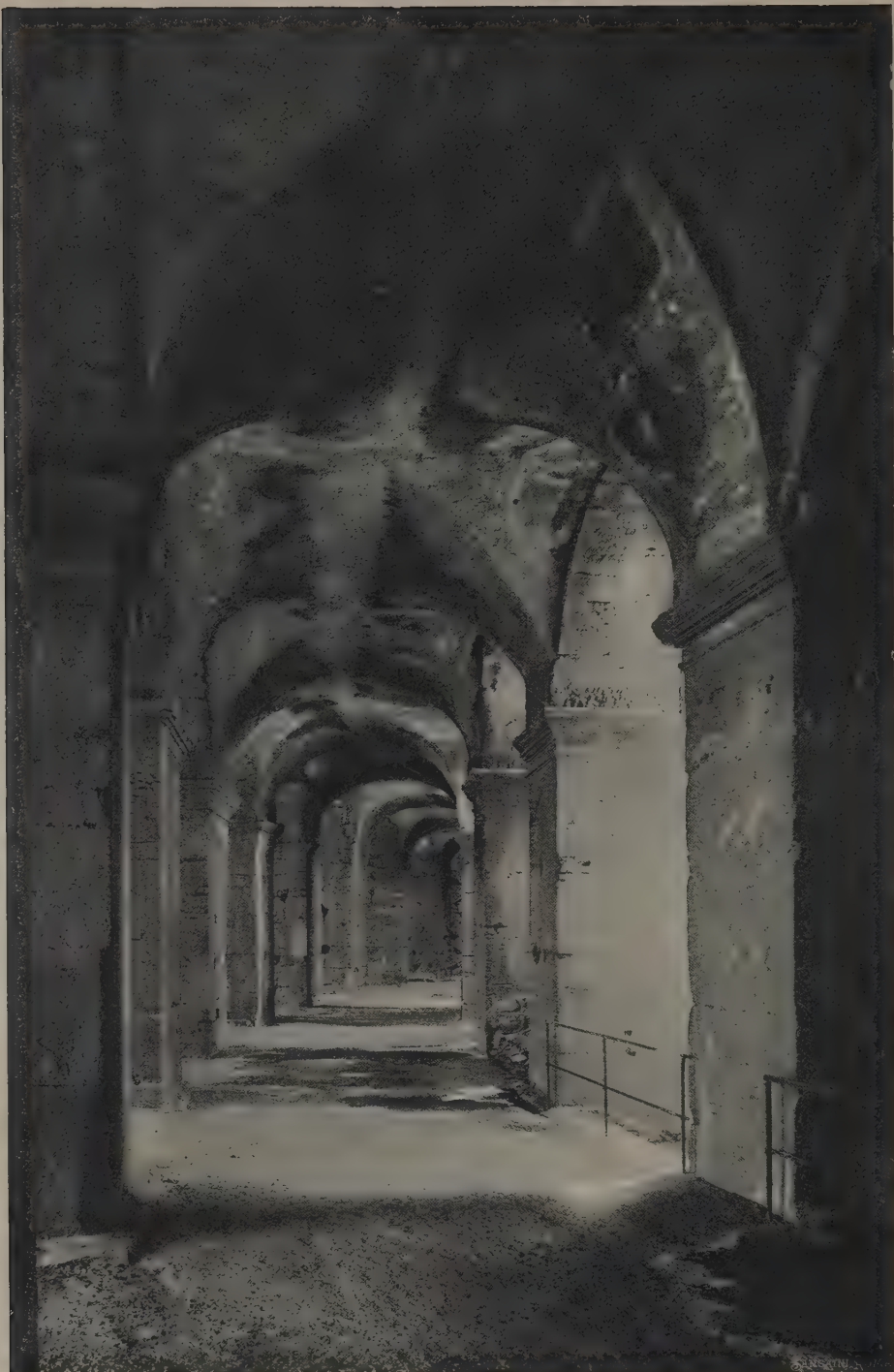


Fig. 102. Coliseum. Vaulted corridor on first floor

6.20 m. (about 20 ft.) on that of east and west.¹ Lastly, two of the piers of the 'Porticus Saeptorum' are walled up in the lower church of Santa Maria in Via Lata.²

A long and patient search which I made with Professor Frattini, the Curator of the Doria Gallery, in the cellars and ground floor of the palace resulted in the



Fig. 103. Rome. The Porticus Saeptorum. (From PIRANESI)

discovery of only a few fragments of travertine piers (so far as meets the eye), but not of any abacus. I was rewarded, however, by the discovery of an original visible arch formed of rusticated travertine blocks, and also remains of cross-vaults supported by piers (one of these had been cut through in the alterations

¹ *Bulletino Comunale di Roma*, vol. xxi (1893), pp. 119-41, HUELSEN, *I Saepta ed il Divibitorium*.

² CAVAZZI, *La Diaconia di S. Maria in Via Lata*, pp. 208, 209.

of 1891) thickly coated with plaster and incorporated in the modern walls. They must be the ones mentioned by Huelsen. Given the rectangular bays of the porticus, the use of such vaulting is easy to understand.

In connexion with the Saepta Julia and their lunette barrel-vaults, it is appropriate to notice that the Roman builders were the first to spring vaulting from isolated piers.¹



Fig. 104. Rome. Nymphaeum in the Gardens of Sallust. (From PIRANESI)

Before concluding our account of the reign of Vespasian, I must call attention to the well-known Nymphaeum of the Gardens of Sallust at Rome, which I believe was erected, together with the palace to which it belongs, in his reign (fig. 104).

The Nymphaeum is a very interesting building, and its central elliptical hall, measuring 11×9.70 m. (36×32 ft.) (fig. 105), is roofed by a high dome of cloister-vault construction (*cupola a padiglione*), the sections being alternately flat and concave (fig. 106). There are views of it by Piranesi and Rossini.² A side room on the left has a good groined cross-vault. Outside at the top there ran a balcony extending to the palace, carried on small semicircular arches (not depressed ones,

¹ PERROT, CHIEPIEZ, *History of Art in Chaldaea and Assyria*, vol. i, p. 14.

² PIRANESI, *Campo Marzio*, tav. xliii. ROSSINI, *I sette Colli di Roma*, tav. x.

as Pirro Ligorio represents them¹) turned on consoles, of which there are numerous traces. This balcony was the model and pattern for others which followed it (fig. 107). The walls of both nymphaeum and palace have fine brick facing without bonding material, as high as the balcony (fig. 108). Above this the existing walls of the palace are of fine reticulate in tufa with quoins and continuous bands of brick facing like the other. Though of such different character, the two buildings are evidently contemporary.

The ruin of the building goes back to Alaric's capture of Rome in 410.² Nibby³ put its date in the first years of the Christian era. But the fact that its brick facing resembles that of the Praetorian Camp does not settle the date; for the substructures of the Baths of Trajan and the hemicycle of Trajan's Forum which is exposed have fine brick facing of identical character. Moreover, the cross-vault of the side-room in the nymphaeum is a type of roof which only appeared under Nero. Besides, the temples erected under Augustus, Tiberius, and Nero show no trace of a cloister-vault dome with alternate flat and concave sections. Reticulate walls, again, with brick quoins and bands, are not earlier than the time of Claudius. Lastly, the projecting balcony carried on arches is, as we shall see, characteristic of the Flavian age.

Now of the four emperors mentioned by the historians as specially connected with the Gardens of Sallust—Vespasian,⁴ Nerva,⁵ Valerian,⁶ and Maxentius⁷—there is every probability that the first ordered the erection of the palace and its nymphaeum, the architect being, perhaps, Rabirius. Nerva's reign was too short and turbulent to admit of it. And the type of masonry excludes Valerian and Maxentius.

The dome described above must be the first of its kind built of solid materials. But we shall soon see another which can be dated accurately.

THE THERMAE OF TITUS were erected by the benevolent emperor on the Oppian hill, on part of the site of the Golden House.⁸ For the plan we must rely on the drawings of Palladio (1518–1580), who saw the structure in a very ruined state (one of his plans, indeed, is left unfinished), and believed it to be the work of Vespasian⁹ (fig. 109). Modern excavations, however, have shown that his drawings are correct in the main lines.¹⁰

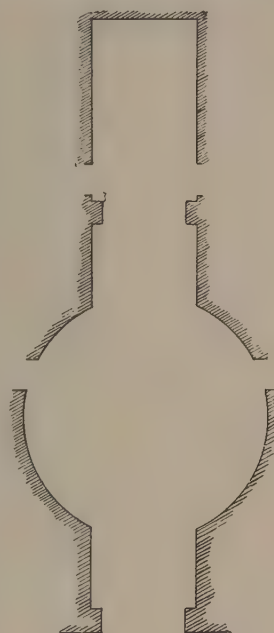


Fig. 105
Plan of Nymphaeum in the
Gardens of Sallust

¹ Vatican Library, Cod. Vat. Lat. 3439, fol. 30. Paris, Bibliothèque Nationale, *Fonds italiens*, 1129, pp. 311–14, *Delle antichità di Pirrho Legori Napolitano*.

² *Corpus Script. Hist. Byz.*, PROCOPIUS, *De Bello Vandalico*, vol. i, p. 316.

³ *Roma antica*, pp. 348–58.

⁴ DIO CASSIUS, lxxvi, 10.

⁵ *Chronica Minora*, vol. i, Chronicon a. 334, p. 117.

⁶ *Script. Hist. Aug.*, VOPISCUS, *Aurelianus*,

49, 1.

⁷ *XII Panegyrici Latini. IX. Incerti panegyricus Constantino Augusto dictus*, 14.

⁸ SUETONIUS, *Titus*, 7.

⁹ BERTOTTI SCAMOZZI, *Le Terme dei Romani diseguate da Andrea Palladio*, tav. v. *R. Institute of British Architects, Palladio, Burlington-Devonshire Collection*, PALLADIO, vol. ii. CAMERON, *The Baths of the Romans*, pl. x.

¹⁰ LANCIANI, *Ruins and Excavations*, pp. 365–7.

In these *Thermae*, scanty remains of whose grand approach may still be seen, we should notice specially the great hall, consisting of a large central space flanked by six smaller bays of various shapes. It is the earliest specimen of the typical central hall (the so-called 'tepidarium') of the great Roman Imperial *thermae*, which attained its grandest form in the Baths of Diocletian, and was the source of important constructive and statical developments.

Another important feature is the unstinted use of cross-vaulting. If we can trust Palladio's elevations (fig. 110), which are not altogether imaginary, the

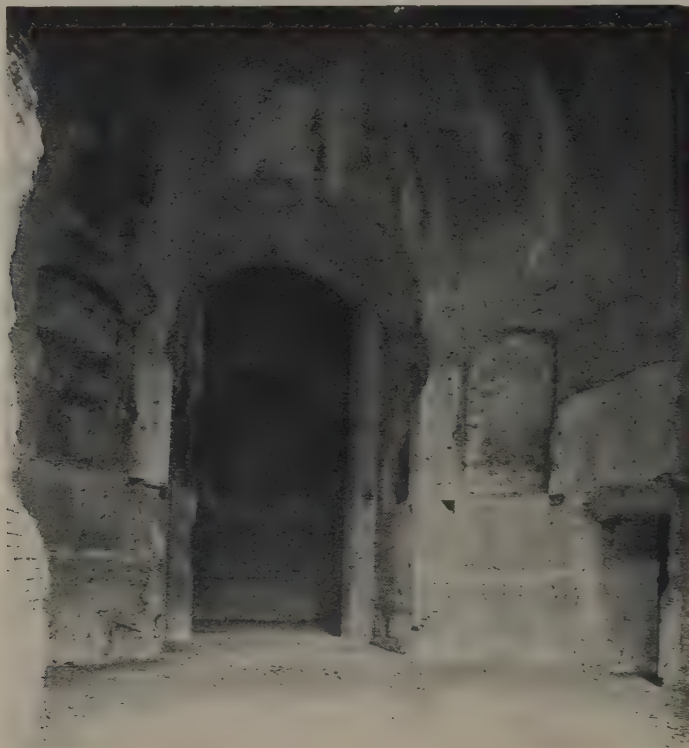


Fig. 106. Interior of Nymphaeum. Gardens of Sallust

vaulting rested directly on the walls. The vaults of the great hall had impost cornices, and their thrust was counteracted by four raking buttresses. In the other rooms, which were rectangular, the vaulting sprang, not from the angles, which would have been too weak to receive the thrust, but at a certain distance from them from a part of the wall which had greater powers of resistance, the cross-vault being confined to a square bay, so that the result was the interpenetration of two semicircular barrel-vaults of which the longitudinal one was prolonged in either direction, avoiding the elliptical curve which would have been produced by an oblong bay.¹

¹ BERTOTTI SCAMOZZI, *Palladio*, op. cit., tav. vi. *R. Inst. Brit. Arch.*, Burlington-Devon-

shire Collection, PALLADIO, vol. ii. CAMERON, op. cit., pl. xi.

This plan of avoiding the angles as starting-points of cross-vaults, even in the case of square rooms, was improved upon later, where fairly large spaces were concerned, by the introduction of angle piers from which the vaulting sprang, as may be seen in the upper square chamber of the tomb of Annia Regilla (p. 151), which is about 8 m. (26 ft.) square (fig. 111).

In the case of small rectangular bays or spaces the vaulting frequently rests on the angles. If in tombs we sometimes find spaces of this kind roofed with a cross-vault of square base and a strip of barrel-vault supported by angle-piers, immediately above the rectangular space occupied by the platform on which the sarcophagus of the deceased stood, this was done in order to give distinction to one part of the monument. An example may be seen in the upper chamber of a tower-like polychrome tomb (the internal dimensions are 5.20×4.40 m. or

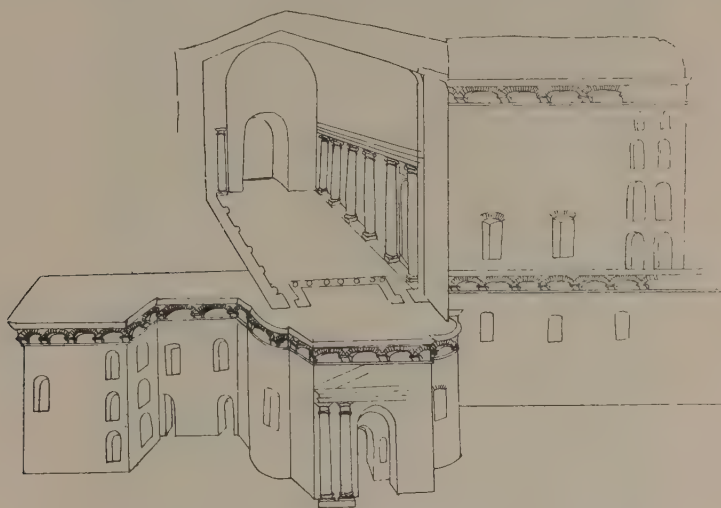


Fig. 107. Pirro Ligorio's drawing of the building in the Gardens of Sallust

17×14 ft.), a little beyond the supposed tomb of St. Urbanus (bishop and martyr), on the right side of the Via Appia Antica at the fourth milestone, and belonging to the age of Marcus Aurelius and Commodus.¹ I may notice here that in one of the tombs of the Marmini at Volterra, believed to be earlier than the third century B.C., two of the four rectangular chambers with ceilings have at the back two angle-piers which convert the oblong space into a square.

Significant in the *Thermae of Titus* is the large number of cross-vaults, sometimes of very great size, one having a span of full 66 ft. (of *Vicenza*²) or 23.10 m. (77 ft.), and two others of 52 ft. or 19.20 m. (64 ft.); whereas, on the contrary, in the largest rooms of Domitian's palace on the Palatine barrel-vaults were used. With our present knowledge the inference may fairly be made that the *thermae* were a trial-ground for experiments by the Roman architects in the creation and development of their great systems of vaulting.

¹ *Pont. Accad. Rom. di Arch., Dissertazioni*, vol. x, ser. 2, part i, pp. 47-64, LUGARI, *Illustrazione*

della pianta degli scavi nella possessione Lugari.
² [i. e. the local scale used by Palladio.]

Such cross-vaults, owing to the oblong shape of the space to be covered, were confined to a central square flanked by two arched sections which are the prolongation of the longitudinal intersecting barrel-vault.

Lastly, one must notice in the building of Titus the typical epistyles shown in a drawing by Palladio which I found in London¹ (fig. 112). For though, before the time of Titus, the Campanians, anticipating by centuries the architects of the East, had been the first to spring arches directly from columns, as in the 'oecus' of the House of Meleager (fig. 113) and the peristyle of the House of Fortune at Pompeii (fig. 114),² in order to get more light and greater architectural elegance, there had been no attempt to make use of broken architraves for carrying heavy arches. These forerunners of the impostos on the capitals in



Fig. 108. Gardens of Sallust. Brickwork

Santa Costanza at Rome (326-329), were copied in the Thermae of Trajan, Caracalla, Alexander Severus, Diocletian, and Constantine.³

THE PALACE OF DOMITIAN. There is no evidence for the theory sometimes advanced that it was begun by Vespasian, continued by Titus, and finished by Domitian. We have no record of works carried out by the first two Flavians on the Palatine, and this has been pointed out long ago.⁴ All that is clear is that Vespasian seldom lived there, his regular residence being in the Gardens of Sallust,⁵ and that Titus had his own 'Domus' on the Oppian where the Laocoon mentioned by Pliny⁶ was discovered, probably between the Baths of Titus and those of

¹ *R. Inst. Brit. Arch., Burlington-Devonshire Collection*, PALLADIO, vol. ii, fol. 4. Figs. 112 and 131 (p. 117) are reproduced by the kind permission of the Institute.

² RIVOIRA, *Moslem Architecture*, pp. 70-1. [CHOISY, *Histoire de l'Architecture*, vol. ii, p. 5. The 'Casa della Fortuna' is in the easternmost

part of Pompeii.]

³ *R. Inst. Brit. Arch., Burlington-Devonshire Collection*, PALLADIO, vols. i, iii, iv, v, vi.

⁴ DONATUS, *Roma vetus ac recens*, p. 22.

⁵ DIO CASSIUS, lxxvi, 10.

⁶ *Plinius, H. N.*, xxxvi, 37.

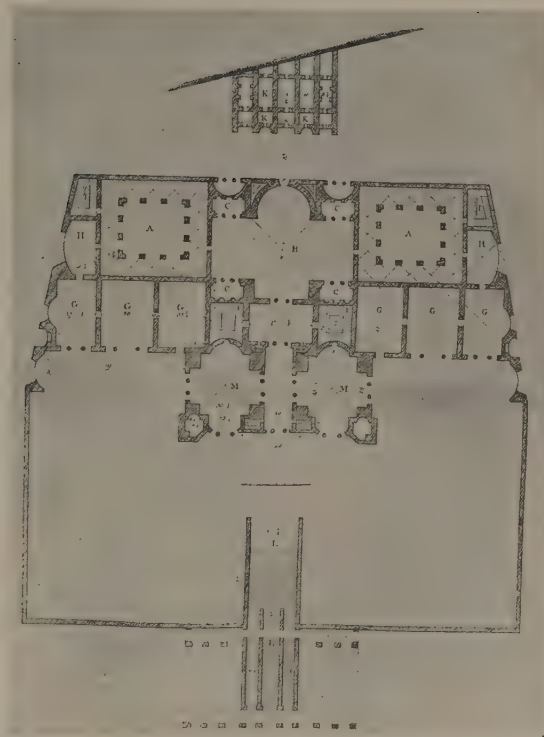


Fig. 109. Palladio's plan of the Thermae of Titus



Fig. 110. Thermae of Titus. Elevation according to Palladio

Trajan.¹ Besides, it was Vespasian's policy, apparently followed by Titus, to take in the matter of building the opposite line to that of the detested Nero : that is to say, to think primarily, not of himself, but of the embellishment of the city and of the wants and tastes of the populace.

On the other hand, we know the name of its author, Rabirius, Domitian's famous architect ;² and Plutarch (c. 50-120), who saw it rising at the emperor's command, calls it 'the house of Domitian'.³ The obvious unity of its conception excludes the work of three emperors; and the great scale and splendour which it exhibits are inconsistent with the cautious statecraft of Vespasian and Titus. Hence it seems to me that we are safe in ascribing the whole of the work to the last of the Flavians.

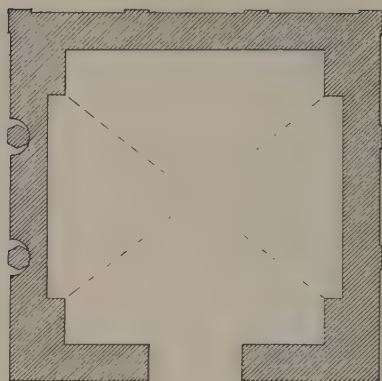


Fig. III

Plan of the tomb of Annia Regilla :
Valle Caffarella near Rome

There are various references to Domitian's palace.⁴ Martial⁵ and Statius (61-96),⁶ under whose eyes it rose, bear witness, even allowing for some exaggeration on their part, to the grandeur and imposing character of the structure, which covered as if with a mantle of state the central part of the hill. The satirist says that for his design Rabirius had embraced in imagination the heavens. The other poet speaks of the lofty walls, the roofs so far above the eye that the vault with its gilded coffered might be taken for the sky, the splendour of the marble wall-linings, and the innumerable columns for ornament and support : in short, of grandeur and magnificence on such a scale that even the temple of Jupiter Capitolinus was lost in amaze. Plutarch is another witness to its splendour.⁷ These tributes need not surprise us, for where is the nation that

has surpassed the Romans in the magnificence of their buildings ?⁸

The city had seen before this the wonderful spectacle of the vast, theatrically planned and sumptuously decorated Golden House. Designed to suit the taste of the fantastic decadent who created it, Rome had not found in it a residence worthy of the ruler of the greater part of the then known world. And yet how strange that the maddest, apparently, among the emperors, full of every vice and devoid of every virtue, were those who were responsible for perhaps the greatest works of architecture in Rome !

Such must the 'Domus Domitiana' have appeared to them, as it certainly did to Martial and Statius. Those who have studied, particularly since Boni's recent excavations, the relics of Rabirius' gigantic and stately work will realize that they fully justify the high praise lavished on it and its author. I will only note, in regard to its great dimensions, that the vestibule or throne-room,

¹ LANCIANI, *Ruins and Excavations*, pp. 368, 369. [The room of the Domus Aurea in which the Laocoon was found has now been identified. F. WEEGE, *Das Goldene Haus des Nero*, *Jahrb. d. K. Deut. Arch. Inst.*, vol. xxviii (1913), p. 231.]

² MARTIAL, vii, 56. [See above, p. 89.]

³ PLUTARCH, *Life of Publicola*, xv.

⁴ *Chronica Minora*, vol. i, p. 117, *Chronicon* a. 334.

⁵ MARTIAL, vii, 56.

⁶ STATIUS, *Silvae*, IV, ii, 18 ff.

⁷ PLUTARCH, *Life of Publicola*, xv.

⁸ PIRANESI, *Della magnificenza ed architettura dei Romani*, *Osservazioni*, p. 5.

measuring 29.30×35.40 m. (97×118 ft.), is 2.70 m. (8 ft. 10 in.) wider than the nave of St. Peter's (26.60 m. or 88 ft.), and 4 m. (13 ft.) wider than that of the Basilica Nova or Basilica of Constantine (23.30 m. or 77 ft.).

This hall had a barrel-vault which must have been at a great elevation, for the tallest piece of the palace ruins, that north-east of the Basilica, in spite of its height, shows no trace of the impost of the roof. Before the excavations took place, Francesco Bianchini about 1720 saw this vault, and those of the Basilica and Lararium on either side of it, lying on the ground, having brought down with them a considerable part of the walls (fig. 115). The vault itself was divided by visible transverse panelled rib-arches.¹ In Italy the practice of dividing



Fig. 112. Thermæ of Titus. Palladio's elevation
(From the *Burlington-Devonshire Collection*, vol. ii, fol. 4)

a barrel-vault into sections by means of transverse arches had been adopted shortly before in the 'vestiarium' of the Stabian Baths at Pompeii after the earthquake of 63. Its origin is to be sought in Assyria, where indications of it have been found in the palace of Sargon (722-705 B.C.) at Khorsabad.² But a coffered roof was a feature of long standing. In the tomb of the Volumnii near Perugia (fourth century B.C.) there are three coffered ceilings cut in the tufa, one of which here figured (fig. 116) is of considerable interest; and in turning over the pages of Canina's work³ one comes across a number of Etruscan tombs decorated with coffers. The Romans, of course, introduced these cavities in their ponderous vaults not merely for ornament, but also to reduce the weight.

The great size of the throne room was not less remarkable than its proportions and sumptuous decoration; and Bianchini says that no apartment in the palace surpassed it in size, or equalled it in magnificence and symmetry. I will only

¹ F. BIANCHINI, *Del Palazzo de' Cesari*, pp. 48, 80, 242-67, tavv. ii-v, viii.

and *Assyria*, vol. i, p. 224.

³ CANINA, *L'antica Etruria Marittima*, &c.

² PERROT, CHAPIEUX, *History of Art in Chaldaea*



Fig. 113. Pompeii. House of Meleager. Arcade



Fig. 114. Pompeii. Arcaded peristyle in House of Fortune

note that the triclinium or dining-room, which also had a banded barrel-vault, as is shown by its wall- and angle-columns, was a quadrangle of 29.03×30.38 m.

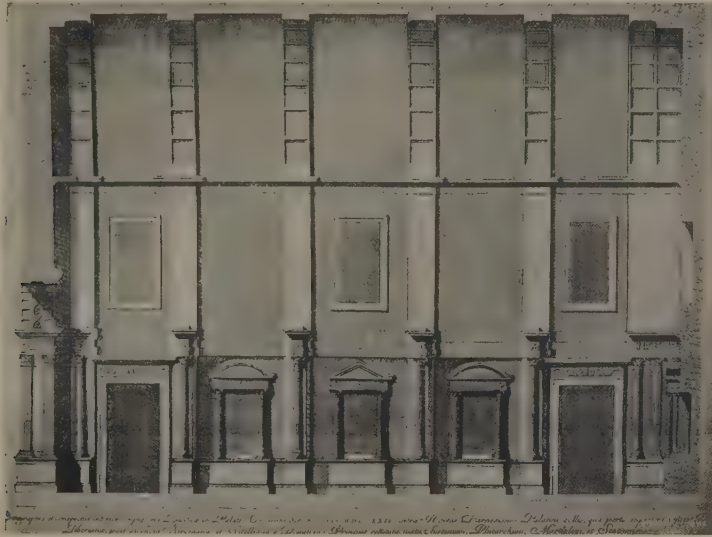


Fig. 115. Rome. Throne-room or vestibule of Domitian's Palace
(From BIANCHINI)



Fig. 116. Perugia. Tomb of the Volumnii
Coffered ceiling

(96×101 ft.), dimensions which explain why Martial says that before this there was no commodious dining-room in Rome.¹

The features to which I would call attention in the 'Domus Domitiana' are these.

¹ MARTIAL, viii, 39.

(1) The semicircular vaults of the throne-room and triclinium, which, together with that of the so-called temple of the deified Augustus, were the largest ever seen, either in East or West.

(2) The Basilica with its apse flanked by two side-chambers ¹ (fig. 117). From this arrangement was developed the idea of chambers set at the ends of the aisles on either side of the apse in the Roman secular basilica, such as the basilica of Otricoli, apparently belonging to the time of Antoninus Pius (138-161), and described by Guattani (1748-1830).² This was a building of very great importance, as it presents for the first time not only the scheme of the Christian basilica with

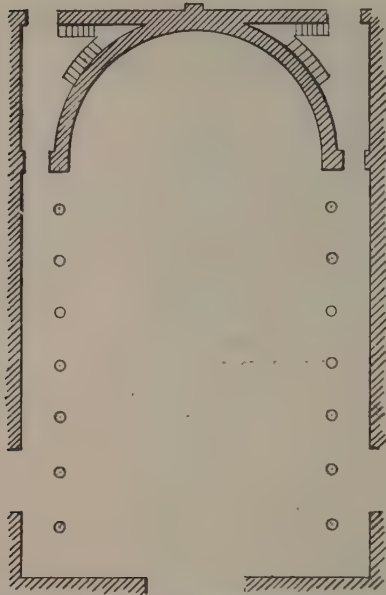


Fig. 117. Rome. Plan of the Basilica in Domitian's Palace

its apse flanked by lateral sacristies, but also the feature of a screen of columns marking off the apse from the nave (fig. 118).³

I may notice that in Domitian's basilica the two aisles are barely 1.90 m. (6¼ ft.) wide between the bases of the columns and the corresponding marble wall-pilasters. It seems therefore that they were merely passage-ways.

(3) The new application of wall- and angle-columns for the support of the vaulting in the throne-room. Remains of the brick pedestals may still be seen.

Nerva described the palace of Domitian as 'aedes publicae populi Romani'⁴—'the State palace of the Roman people'.

THE 'DOMUS AUGUSTANA' (Augustiana) or House of Augustus was burned in the year A.D. 2 and rebuilt.⁵ The new residence must have suffered in the fire of Nero, when the Palatine was almost entirely devastated.⁶ And it has been thought that it may have been damaged in the fire caused by the supporters of Vitellius, or the succeeding one due to accident under Titus.⁷

Although there is no statement in the historians that it was rebuilt by Domitian, nevertheless a comparison with his works on the Palatine establishes without difficulty the fact that Domitian's Palace and the House of Augustus are of the same date. Moreover, it is clear that the two structures form part of a single plan laid down at the outset.

Evidence is forthcoming in the shape of a large lead pipe bearing Domitian's name, discovered in connexion with a lavatory ('sterquilinium') which it supplied with water;⁸ and also various fragments of cornice found in the great peristyle showing a close analogy in style to those of the Forum of Pallas (Forum Transi-

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 21, 22.

² GUATTANI, *Monumenti antichi inediti*, or *Notizie sulle Antichità e Belle Arti di Roma per l'anno 1784*, pp. xxvii-xxxiv, tav. i.

³ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 128-30.

⁴ PLINIUS, *Panegyricus*, 47.

⁵ SUETONIUS, *Augustus*, 57, 72. DIO CASSIUS, xlix, 15; liii, 16; lv, 12.

⁶ DIO CASSIUS, lxii, 18.

⁷ BIANCHINI, *Palazzo de' Cesari*, pp. 97, 98.

⁸ GUATTANI, *Monumenti antichi inediti* (1785), p. lxxviii.

torium) and the Arch of Titus.¹ And in any case, the fact that the walls are faced with triangular baked bricks is decisive against an Augustan date.

In the 'Domus Augustana' rebuilt by Domitian were collected in the time of Hadrian some of the furniture and personal relics of the founder of the Empire.² The ground plan is very interesting, full as it is of devices for the harmonious and original combination of rooms shaped in every conceivable way (figs. 119, 120). The ancient world had produced nothing like it so far. Guattani had remarked

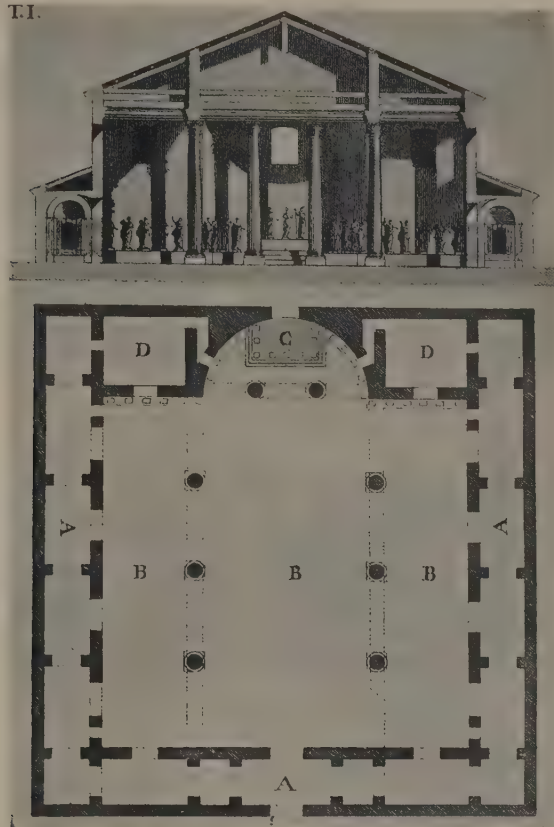


Fig. 118. Otricoli. Plan and elevation of the Basilica
(From GUATTANI)

the strange, fanciful plan of the rooms with eight recesses on the west front ;³ rooms perhaps suggested by one of the same type, though larger, on the north side of the atrium in Domitian's palace. From rooms of this kind are derived in some cases Oriental interiors of complicated outline, of which there is an instance in the palace or castle of Firuz Abad, ascribed to the reign of Chosroes (591-628), or to the time of the first Abbassid Caliphs (750-1258).⁴

In these two eight-sided rooms the octagon is produced by recesses taken out

¹ NIBBY, *Roma Antica*, ii, p. 419.

² SUTTONIUS, *Augustus*, 73.

³ GUATTANI, *op. cit.*, p. xxix.

⁴ RIVOIRA, *Moslem Architecture*, pp. 114, 120, 132.

of the angles, and above them the vault rises, passing gradually, like the grand one we saw in the Golden House, from the straight-sided base to the spherical form till it reaches the keystone opening at the top (fig. 121). The result was unprecedented either in plan or elevation. At a later date Julianus Argentarius started with a similar conception for his design of the dome of San Vitale at Ravenna (526-547).¹

On the other hand, the central room, lighted by a window opening on the court, is roofed by a very low pendentive dome starting from pointed bases or springers (a sort of rude triangular raccords or pendentives), which are flat instead

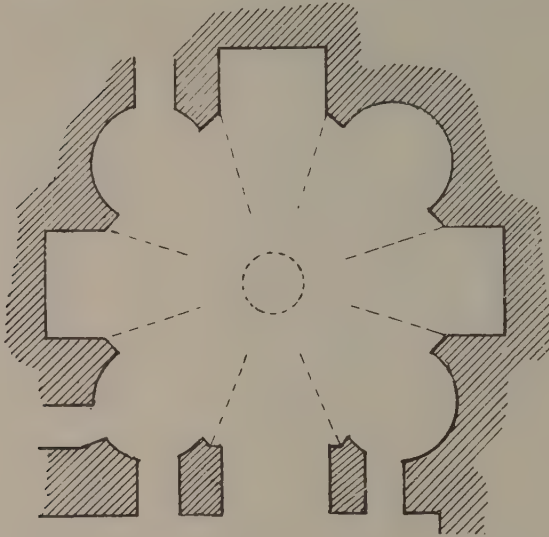


Fig. 119. Rome. Plan of one of the lateral rooms in the House of Augustus on the Palatine

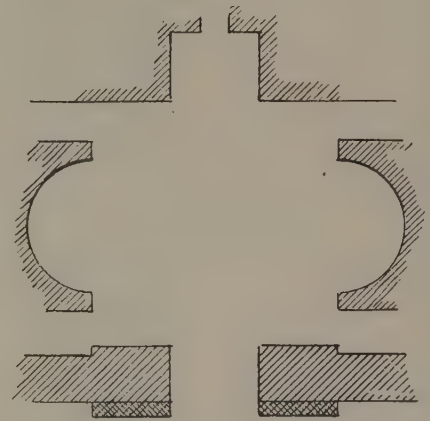


Fig. 120. Rome. Plan of central room in the House of Augustus

of bellying out like a sail with the wind, and pass imperceptibly into the dome itself (fig. 122). The curve of the latter was determined by the tall niches in the side-walls, which give such a dignified effect to this important room, and by the necessity of confining it within the limits imposed by the level of the floor above. Any danger from the considerable thrust was counteracted by the thickness of the walls of the room and their abutments. Without these limitations it would have become a dome like that in the tomb on the Via Nomentana known as the 'Sedia del Diavolo', and still more in another on the same road near the Casale dei Pazzi. The dome with pendentives in the House of Augustus is the earliest example that I have come across.²

In these rooms may also be noticed the use of vaulted recesses, e.g. in the central chamber, with the object of relieving the straight arches of the great rectangular niches in an economical way.

The name 'Domus Augustana', perpetuating that of the first Imperial residence, absorbed the title given by Nerva to Domitian's palace—'aedes publicae populi Romani'; so that in the fourth century *Regionary Catalogues* only three

¹ RIVOIRA, *Lombardic Architecture*, vol. i, p. 71.

² RIVOIRA, *Moslem Architecture*, p. 234.

Imperial residences are registered on the Palatine: the 'Domus Augustiana', the 'Domus Tiberiana', and the 'Septizonium divi Severi'.¹

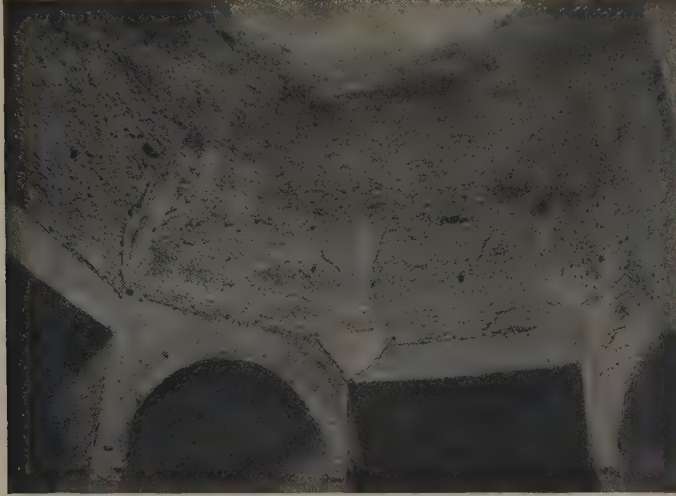


Fig. 121. Vault of one of the octagonal lateral rooms in the House of Augustus

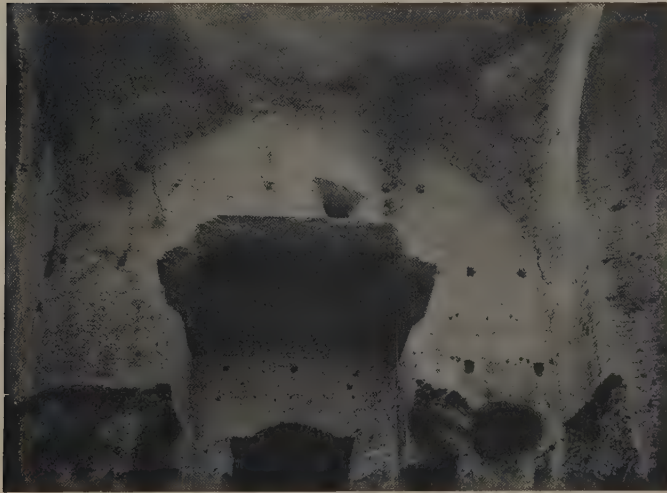


Fig. 122. Pendentives of the vault in the central room of the House of Augustus

The 'Domus Augustana' was bounded on the south by the Stadium of Domitian, to which it had a public entrance through a vestibule on the south-east paved with great slabs of basalt (fig. 123).

¹ [URLICHS, *Codex Urb. Romae Top.*, pp. 14, 15. JORDAN, *Topographie*, vol. ii, p. 557.]

THE TEMPLE OF THE DEIFIED AUGUSTUS (*Templum Divi Augusti*) was begun by Tiberius (14) and finished and dedicated by Caligula in the year 38.¹ After being destroyed by fire it was rebuilt by Domitian,² and is evidently the edifice of which the chroniclers write: 'Domitianus sine lignorum admistione templum fecit' (under A.D. 86).³ It was restored by Antoninus Pius between 151 and 160.⁴ In a drawing by Pirro Ligorio it is called the temple of Jupiter Stator.⁵

The general opinion to-day is that the ruins of the three-sided colossal structure of rectangular plan measuring 32.30 × 23.50 m. (107 × 85 ft.), and still rising to a height of quite 29 m. (96 ft.) above the ancient pavement, which stand at the foot of the Palatine near the *Vicus Tuscus*, are those of the cella of this temple⁶ (fig. 124). The extraordinary thickness of the walls—3 m. (9 ft. 9 in.) in the



Fig. 123. South-east side of the House of Augustus with entrance from the Stadium

shorter walls and 2.40 m. (8 ft.) in the longer ones—together with their construction which we will describe presently, show that it was roofed with a barrel-vault like those of the great halls of Domitian's palace. This vault was certainly the most lofty known to the ancient world, for at its crown it would be some 45 m. (150 ft.) above the floor. The far-famed barrel-vault of the palace or castle of Chosroes I (531–579) at Ctesiphon is believed to be only a little more than 31 m. (103 ft.) high.

¹ SUETONIUS, *Tiberius*, 17; *Caligula*, 21. DIO CASSIUS, lvi, 46; lxi, 7.

² JORDAN, HUELSEN, *Topographie*, vol. i³, pp. 80–5.

³ MIGNE, *Patr. Lat.*, vol. xxvii, col. 460, HIERONYMUS, *Eusebii Chronica*. [FOTHERINGHAM, op. cit., p. 272.]

⁴ COHEN, *Médailles Imp.*, vol. ii, p. 349, nos. 797–810. DE GRUNEISEN, *Sainte Marie*

Antique.

⁵ Bodleian Library, Canonici MSS. 138, PIRRO LIGORIO.

⁶ [Delbrueck has now shown that it was probably a vestibule or reception room for Domitian's palace on the level of the Forum. *Jahrb. d. Deut. Arch. Inst.*, vol. xxxvi (1921), pp. 8–33.]

The question has been raised whether there ever was such a vault, because it has not left in its fall any substantial remains.¹ I only remark that the hall had been excavated at least five times before 1897,² and there was plenty of time and opportunity for the remains to disappear. Besides, a timber roof would not have required walls either so massive or of such scientific construction.

These walls, which are of concrete with brick and tile facing, show a large and scientific use of relieving arches and flat arches, the object of which was to bind the facing and the core together, to lighten from the top downwards the weight on the recesses at the bottom, to subdivide the walls into zones of adjustment so as to avoid serious cracks, and to discharge the weight of the mass on the side-walls of the recesses.



Fig. 124. Rome. 'Templum Divi Augusti'. Interior

The catastrophe must have been due to earthquake shocks, preceded by other injuries which endangered the solidity of the mass, among them being the removal of the tiles above the extrados, with the inevitable consequence that rain-water filtered in and vegetation took root and disintegrated the huge vault, which in its fall brought down with it parts of the walls.

This great temple with its semicircular concrete vault had the merit of novelty : there was nothing like it before in the ancient world. With it Rabirius spoke a new word ; and one can understand why the chroniclers gave it a special notice.

We will conclude our account of the Flavian age by an account of the tomb of Priscilla, on the right of the Via Appia Antica after crossing the Almone. It was erected by Abascantus, a favourite freedman of Domitian.³ From the description of Statius and the existing remains we see that it was a two-storied building, on an imposing scale and of very sumptuous character, thus illustrating the truth that the magnificence of monuments is more often due to wealth and vanity than to celebrity.

¹ HUELSEN, *Foro Romano*, p. 156.

² LANCIANI, *Ruins and Excavations*, p. 124.

³ STATIUS, *Silvae*, V, i, 222 ff. NIBBY, *Roma Antica*, ii, pp. 557-60.

The lower floor consists of a square block, each side measuring about 20 m. (65 ft.), containing the cruciform mortuary chamber, the central space of which, 4.50 m. (15 ft.) square, is covered by an ungroined cross-vault. The upper floor exhibits the ruins of a circular outer wall in good reticulate, from which starts a series of thirteen semicircular niches, one being smaller than the rest (fig. 125), not ten or eight, as in Canina's¹ and Bartoli's² illustrations. They also are in reticulate, with their convex sides projecting into the interior of the tomb, and are partly concealed in the face of the external wall. In the free space of the interior is a base, 6 m. (20 ft.) square, which now supports a round tower of rude work. What it carried originally I do not know, nor how the dome ('tholus'³) mentioned by Statius was carried out.

Notice should be taken of the plan of a circle of detached or free niches. It is the beginning of a quite original means of producing variety in the outline of circular buildings. Hitherto such recesses had only been taken out of the thickness of the wall—there is an early example in the Mausoleum of Augustus—never constructed as detached or standing free. The development of this principle was reserved for the emperor-architect, Hadrian, at a later date, and we shall find it employed at his great villa in the vestibule of the Piazza d'Oro.

¹ *Edifici*, vol. iv, tav. cclxx.

² *Gli antichi sepolcri*, tavv. 28, 29.

³ [Baehrens corrected *tholo* to *luto* in STATIUS, *Silv.*, V, i, 233, and Professors Postgate and

G. Davies have adopted this reading in the new *Corpus Poetarum Latinarum*. The reference will thus be to a terra-cotta statue, not to a dome.]

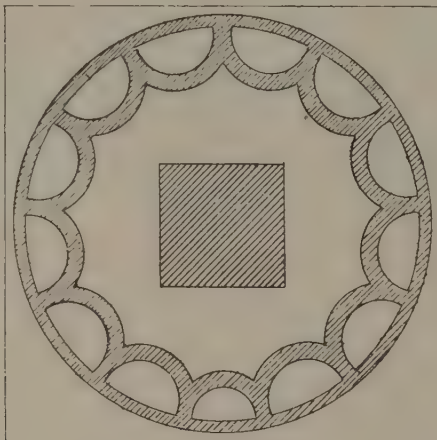


Fig. 125

Plan of the upper floor of the Tomb of Priscilla on the Via Appia near Rome



VII. TRAJAN

IF we may judge by what Ammianus Marcellinus (d. about 390) tells us about the 'Forum Traiani', the Rome of Trajan prided itself above all on the consummate artistic effect of the component parts of that Forum, where the architect employed by 'the best of emperors' achieved his greatest success. The daring originality of Rabirius, first and foremost an architect-engineer, was succeeded by the high artistic endowment of Apollodorus, essentially the architect-artist.

THE FORUM OF TRAJAN, the last and most splendid of the Fora of Rome, was erected from the designs of Apollodorus of Damascus (about 60-130)¹ in 112-113; and, though unfinished, it was dedicated in the latter year.² It included: the Propylaea or entrance with the founder's triumphal arch, the Forum proper with his equestrian statue in the centre, the Basilica Ulpia, the Library, and the Column with its chronicle in marble (fig. 129).

The Forum proper was a quadrangular court enclosed by colonnades, and flanked on the east and west by two great hemicycles (fig. 130)—the idea was taken from the Forum of Augustus—of which the eastern survives and is still partly exposed at the foot of the Quirinal, waiting for its fellow to be disinterred.³ This hemicycle (figs. 126, 127, 128⁴), which when perfect had four floors (two having staircases) with a terrace-roof, exhibits in the two much-damaged surviving stories beautiful brick facing which may be compared with that of the stylobate of Domitian's Temple of Victory (Aedes Victoriae) on the Palatine, recently excavated, and with that of the Nymphaeum in the Gardens of Sallust. The ponderous design of the doorways to the shops on the ground floor, the want of elegance in the windows of the first floor and their close order recalling that of the Augustan Porta Palatina at Turin, together with the pilasters of the Tuscan order and the rounded, triangular, and broken pediments, give it a frankly Roman air such as would suit the time of the Flavians. Consequently it has been conjectured, not without reason, that Domitian may have already prepared the site for a 'Forum Maximum' and commenced operations.⁵ As a matter of fact we are told by Suetonius that he built the Forum Transitorium ('Forum quod nunc

¹ DIO CASSIUS, lxviii, 16, 29; lxix, 4.

² NIBBY, *Roma Antica*, ii, pp. 183-221.

³ *Bollettino d'Art.*, v (1911), pp. 445, 454, C. RICCI, *Per l'isolamento e la redenzione dei resti dei Fori Imperiali*.

⁴ [HUELSEN, *Libro di Giuliano da Sangallo*,

p. II.]

⁵ *Notizie degli scavi*, ser. v, vol. iv (1907), pp. 361-427, G. BONI, *Esplorazione del Forum Ulpium*. *Nuova Antologia*, 1 March 1907, G. BONI, *Un epilogo*.

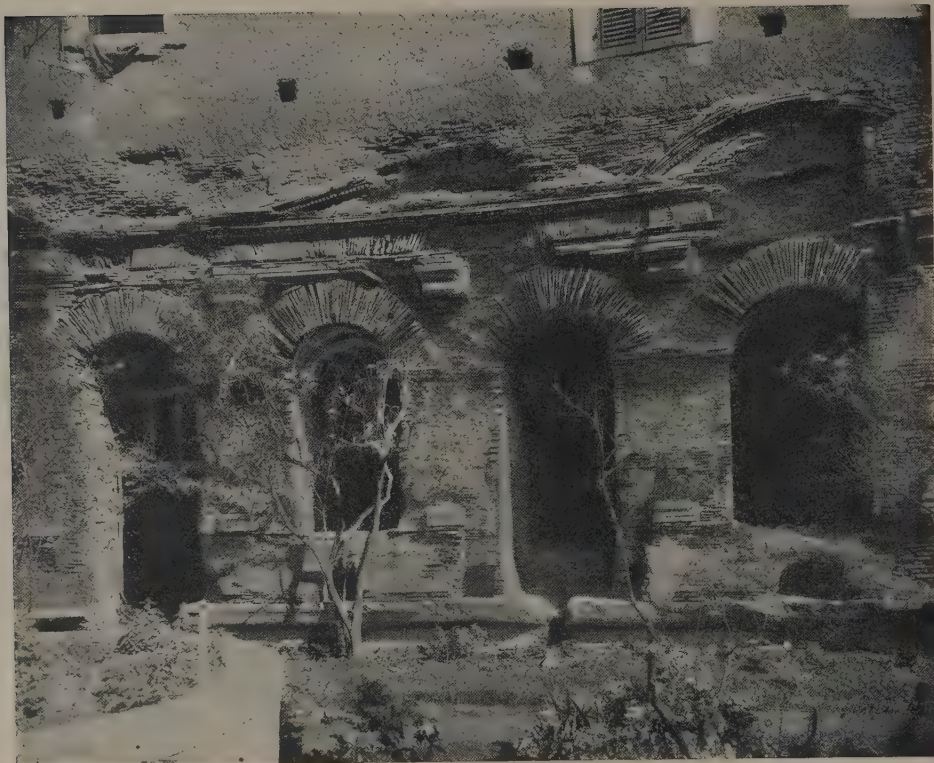


Fig. 126. Forum of Trajan. Part of the eastern hemicycle



Fig. 127. Forum of Trajan. Part of the eastern hemicycle

Nervae vocatur'¹), afterwards dedicated by Nerva (96-98) in 97.² But Aurelius Victor (fourth century) writes of Trajan: 'Adhuc Romae a Domitiano coepta forum atque alia multa plusquam magnifice coluit ornavitque',³ and it seems improbable that the Latin historian, well acquainted as he was with things at Rome, of which he had been Prefect about 392-393,⁴ would have deliberately invented such an origin for the Forum. Accordingly, it may be worth considering whether an essential part of the plan of Nerva's Forum Transitorium was not a temple dedicated to Minerva, to whose cult Domitian was specially

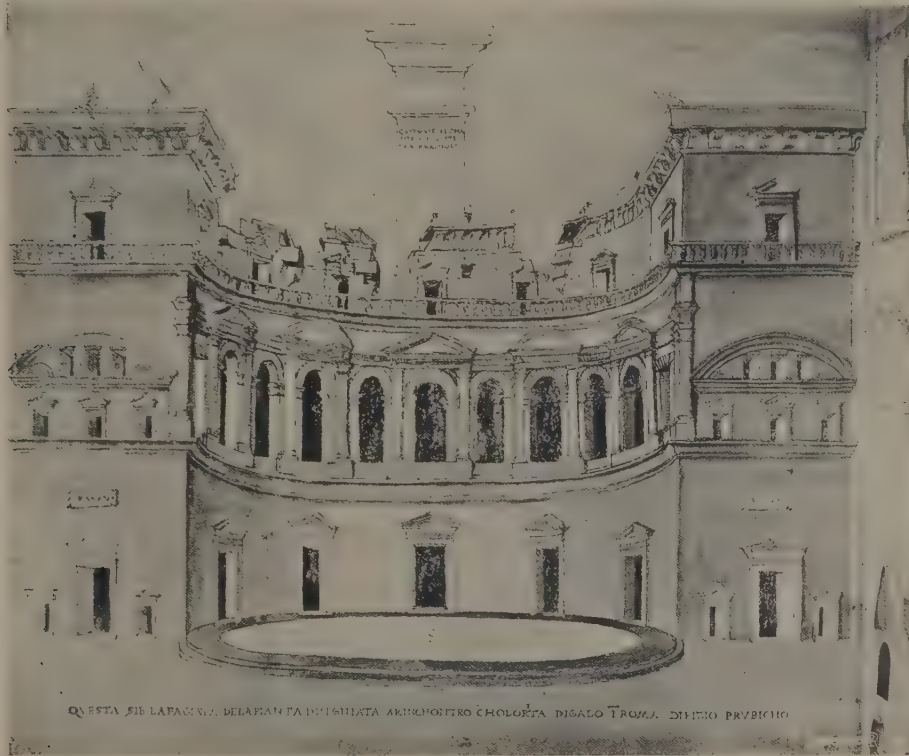


Fig. 128. Forum of Trajan. The eastern hemicycle from a drawing by Sangallo (Cod. Vat. Barb. Lat. 4424, fol. 5 v.)

devoted; and whether it were not actually in the reign of the last of the Flavians that the 'Forum Magnum' conjectured by Boni was projected and begun.

The Basilica Ulpia, which stood on another part of the site, was also bounded at either end by a hemicycle or apse. The design, which was copied on a much smaller scale in the Civil Basilica at Silchester,⁵ is the forerunner of churches planned with an apse at either extremity, among the early examples of which I reckon the church of St. Reparatus near Orléansville (fourth-fifth century), the abbey-churches of Abingdon (675), St. Gall (822-829), Fulda (790-819), and

¹ SUETONIUS, *Domitianus*, 5.

² AURELIUS VICTOR, *Liber de Caesaribus*, 12.

³ AURELIUS VICTOR, *op. cit.*, 13.

⁴ COMPARETTI, *Museo italiano di Antichità classica*, vol. iii, pp. 480-548, G. TOMASSETTI,

Note sui Prefetti di Roma.

⁵ *Archaeologia*, vol. liii, part 2 (1893), pp. 549 ff., FOX and HOPE, *Excavations on the Site of the Roman City of Silchester*.



Fig. 129. Forum of Trajan in its present state

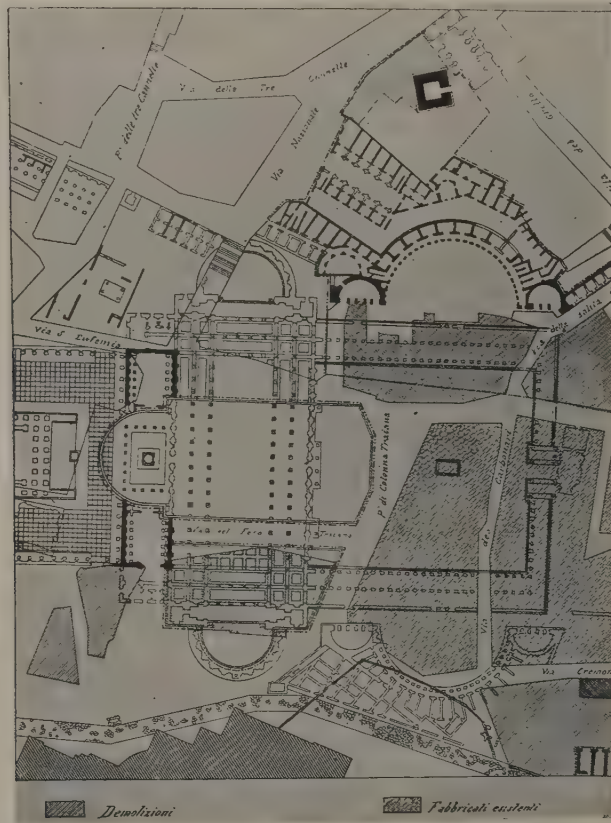


Fig. 130. Rome. Plan of Trajan's Forum
(From *Bollettino d' Arte*, vol. v)

Gernrode (tenth century), and the cathedrals of Cologne (eighth–ninth century) and Hildesheim (851–872).¹

It has been supposed that the nave of the Basilica was roofed with bronze ; but the mention in Pausanias (*δροφον χαλκοῦ*) is too general, including as it does the whole Forum, to allow it to be applied specially and exclusively to this part of it.²

The group of buildings forming the Forum of Trajan gave Apollodorus, as an architect-artist of high merit belonging to the Hellenistic world, the opportunity of displaying in the designs for which he was responsible the incomparable Greek sense of elegance in art and decoration.

To this group Hadrian added, as we shall see, as its crown the temple of colossal dimensions erected in honour of Trajan and Plotina.

We cannot be surprised at the lavish praise which the general effect of the Forum drew from Ammianus Marcellinus, even though we make allowances for the Graeco-Asiatic temperament of the author: 'Traiani forum . . . singularem sub omni coelo structuram.' Nor can we wonder at the astonishment which it caused to the Emperor Constans (337–361) when he saw it on his brief visit to Rome in 356.³

On leaving his Forum we must say a few words on the Thermae of Trajan, designed by the same architect,⁴ but undoubtedly carried out by Roman craftsmen, as the construction shows. With the drawings of Palladio before us,⁵ the following points may be noticed.

(1) The method of springing the cross-vaulting from wall- and angle-columns, derived from the treatment of the transverse arches of the barrel-vault which we noticed in the throne-room and triclinium of Domitian's palace. By this method the burden is no longer borne only by the thickness of the walls, but is shared by the secondary supports.

(2) The decoration of the interior of exedrae or curved recesses by a series of columns. Such are shown in Palladio's elevation, and in one case he has given a sketch with details, which is here reproduced (fig. 131).

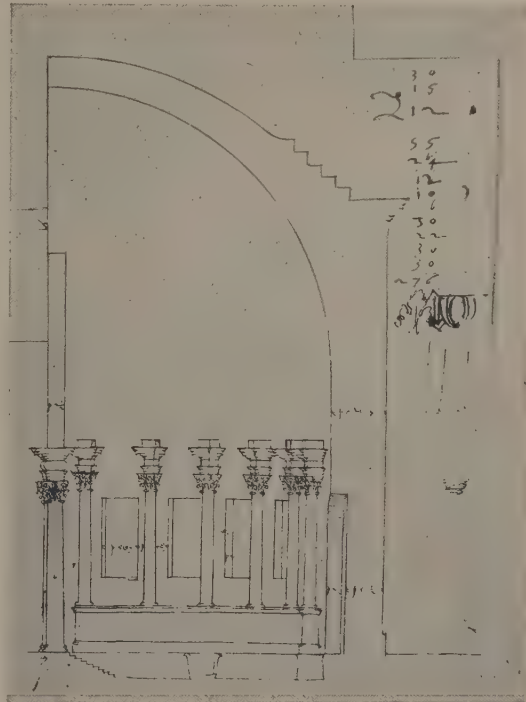


Fig. 131. Palladio's elevation of the Thermae of Trajan. (From the *Burlington-Devonshire Collection*, vol. iv, sheet 5)

¹ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 151–3, 285, 286, 298, 299.

² PAUSANIAS, v, 12; x, 5.

³ AMMIANUS MARCELLINUS, xvi, 10.

⁴ DIO CASSIUS, lxi, 4. PAUSANIAS, v, xii.

⁵ BERTOLOTTI, SCAMOZZI, *Le Terme dei Romani*, tavv. vii, viii. *R. Inst. Brit. Arch., Burlington-Devonshire Collection*, PALLADIO, vol. iv, fol. 5.



VIII. HADRIAN

THE accession of Hadrian was followed by a rapid and notable advance in Roman construction; so much so that the twenty-three years of his brilliant reign were among the most important in the history of architectural progress. And this was due to the direct activity of the versatile emperor, whose failings have been more often dwelt upon than his merits.

The wall-masses, which had already been made less rigid by the introduction of relieving arches, and were occasionally supplemented, in the case of large rectangular cross-vaulted rooms, by wall and angle supports, but nevertheless continued to form the dead weight of resistance on which the static system of Roman architecture was based, underwent notable modifications in their function. Thus, in domed buildings—the most important expression of the constructive and statical science of vaulting in the Roman world during the second century—there was the introduction of the organic framework or skeleton (*scheletro di forza*), the articulation of the organism with concentration at given points of the static activities.

I have stated my views about Hadrian as an architect elsewhere.¹ Not long before, Promis had also written about him, and made him out to be a great architect but not a Roman one, because his buildings showed him to be Greek.² I am now going to deal with the subject afresh, making some correction and amplification of my previous statement. We shall see by the test of the monuments what place this great world-ruler held in the realm of art; and we shall discover in all its luxuriance the power and fertility of his genius.

We learn from Spartianus that Hadrian, among his many intellectual qualifications, possessed in an eminent degree those which are indispensable to an architect: 'Fuit enim . . . arithmeticae, geometriae, picturae peritissimus.'³

We have no precise information whether he provided the plans of all the numerous buildings erected by his command in the Roman world through which

¹ R. *Accademia dei Lincei, Rendiconti*, vol. xviii, fasc. 3, RIVOIRA, *Di Adriano architetto e dei monumenti adrianei*. RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 100-3. *Nuova Antologia*, 16 April 1910, RIVOIRA, *Adriano architetto ed i monumenti adrianei*.

² *Mem. della R. Accad. d. Scienze di Torino*, ser. ii, vol. xxvii, C. PROMIS, *Gli architetti e l'architettura presso i Romani*, pp. 7, 51, 163, 177-80.

³ *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 14, 9.



Fig. 132. The Pantheon. Exterior

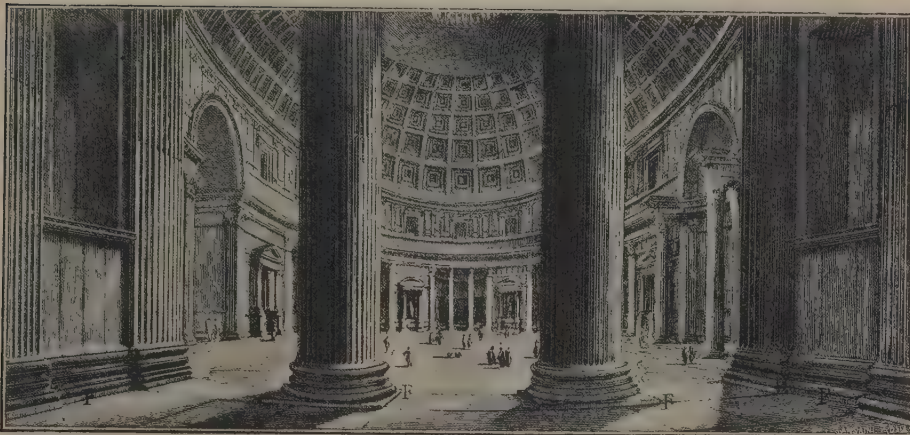


Fig. 133. Pantheon. Interior
(From PIRANESI)

he made his progresses between 121-126 and 128-132¹ ('in omnibus paene urbibus et aliquid aedificavit'²), some of them being famous and the temple of Cyzicus reckoned as one of the wonders of the world.³ But we gather from a passage in Dio Cassius that the buildings which he erected in Rome and its vicinity were



Fig. 134. Pantheon. Interior

the result of the direct action of his mind and hand. The historian relates that Hadrian sent to Apollodorus his own designs for the temple of Venus and Roma, to let him see that important buildings could be erected in the capital without his help.⁴

¹ STUART JONES, *The Roman Empire*, p. 180.

² *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 19, 2.

³ *Corpus Script. Hist. Byz.*, MALALAS, *Chronographia*, xi, 364.

⁴ DIO CASSIUS, lxix, 4.

Confining ourselves to the evidence of the buildings or ruins of buildings which still exist, the principal vaulted edifices for which the Imperial architect was responsible at Rome were: the Pantheon and the temple of Venus and Roma in the city itself, and the Imperial villa near Tivoli. I omit the *Thermae of Agrippa* which he rebuilt, as the meagreness of the remains to be seen above-ground, and the conflicting views as to what they were, make it impossible to discuss them with any profit in this connexion.



Fig. 135. Pantheon. Wall-facing

Another great conception of his (in this case with a wooden ceiling) was the temple which he erected in honour of Trajan and Plotina ('parentibus suis'); and on it, by way of exception, he inscribed his own name.¹ It bounded the Forum of Trajan on the north, and was of colossal proportions, as is attested by the existing remains of its magnificent columns, granite monoliths 1.90 m. (6¼ ft.) in diameter, with Corinthian capitals 2.5 m. (8¼ ft.) high. The site which it occupied must have seemed appropriate, providing as it did the contrast between

¹ *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 19, 9. *C. I. L.*, vi, 966, 31215. [DESSAU, 306.]



Fig. 136. Pantheon. Section of the drum
(From BELTRAMI, *Il Pantheon*, tav. ii)

¹ DIO CASSIUS, liii, 27.

² [C. I. L., vi, 896. DESSAU, 129.]

³ DIO CASSIUS, lxvi, 24.

⁴ *Chronica Minora*, vol. i, pp. 116, 117, *Chronicon* a. 334.

⁵ OROSIUS, *Historiae adversum paganos*, vii, 12.

the powers of two architects of the first rank, Hadrian and Apollodorus.

Now let us turn to Hadrian's vaulted buildings.

THE PANTHEON was erected by Agrippa, and was solemnly dedicated, together with the adjacent *Thermae*, in 25 B.C.¹ The year 27 B.C. which appears on the inscription of the portico² may refer to the foundation of the structure. After suffering considerably from the great fire of the year 80,³ it was restored by Domitian;⁴ but in 110 it was again destroyed by fire caused by lightning (which shows that it had a wooden roof), and Hadrian proceeded to rebuild it⁵ (figs. 132, 133, 134).

The investigations carried out in 1892–1893 make it certain that the existing rotunda with its rectangular projection is entirely the work of Hadrian, the brick-stamps giving dates approximately between 110 and 125; and also that the octostyle portico which forms the façade is a later addition to the circular brick structure. They have also shown that the present building stands on a site which was previously occupied by other buildings, and that the portico partly rests on new concrete walls, and partly makes use of older work which points to a rectangular building constructed of large rusticated blocks, with its main axis corresponding to that later adopted for the rotunda: in other words, the remains of Agrippa's Pantheon.⁶

This portico, with the bronze girders and trusses of its roof, intended to make it fireproof (Ligorio and others have left drawings of it⁷), must also have been the work of Hadrian, for its original Corinthian capitals are exactly like those of the same kind inside the rotunda. The inscription

⁶ BELTRAMI, *Il Pantheon* (Milan, 1898), pp. 37–75.

⁷ Turin, *Biblioteca del R. Archivio di Stato*, original works of PIRRO LIGORIO, vol. xiii. [LANCIANI, *Ruins and Excavations*, Fig. 188, p. 485.]

with the name of Agrippa on the architrave is due to the fact that the emperor reproduced the name of the founder in the place of honour, it being his practice never to put his own name on the buildings which he erected, with the solitary exception of the temple dedicated to Trajan.¹

The inscriptions added later with the names of Septimius Severus and Caracalla must refer to the restoration in 202 of this part only of the Pantheon, and not the whole building; and here again the name of the founder was preserved, as was usual with Severus ('Magnum vero illud in vita eius, quod Romae omnes aedes publicas, quae vitio temporum labebantur, instauravit nusquam prope suo nomine adscripto, servatis tamen ubique titulis conditorum'²). The rotunda, built for eternity, could not have been 'vetustate corruptum', as the inscription says, after about eighty years of existence. Perhaps the portico had suffered in some way under Antoninus Pius (138-161), and the restoration mentioned by Julius Capitolinus³ may refer to this.

It was, then, Hadrian's Pantheon which Dio Cassius saw,⁴ which was admired by Ammianus Marcellinus for its dome ('Pantheum velut regionem teretem speciosa celsitudine fornicatam'⁵), and was one of the wonders of Rome. And it formed the starting-point for all the great architects of the fifteenth and sixteenth centuries who made a study of Roman architecture.⁶

The investigations above referred to have also revealed with certainty, and to a great extent, the static and constructive principles of the building; showing how incorrect were the graphic reconstructions of the original design of the interior.⁷ The account which follows is based on these investigations, and on researches and observations of my own, in some respects correcting, and in others supplementing them.

The drum has a core of concrete faced with triangular bricks and courses of large tiles at intervals. On the exterior it rose above the start of the dome, as high as about the second row of coffers inside, forming the attic; and it contains three tiers, one above the other, of relieving arches separated by cornices or string-courses of the Roman type (i.e. of large tiles, sometimes whole, sometimes split), which bind the wall-facings together and also to the core of concrete (fig. 135). The arches in the attic are continuous, formed of two rings, and

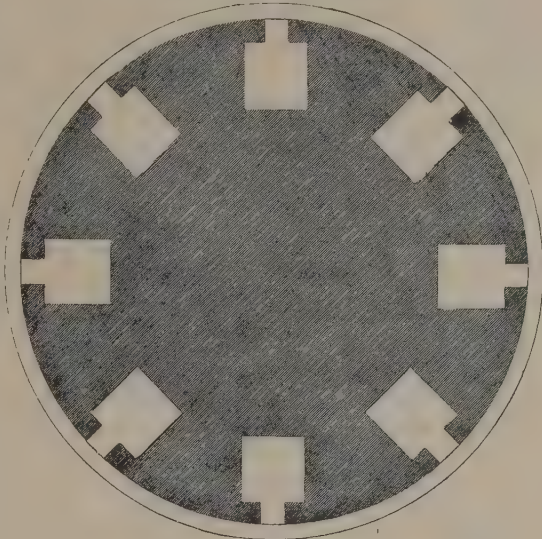


Fig. 137. Corneto Tarquinia. Plan of tomb
(From CANINA)

¹ *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 19, 9.

² *Script. Hist. Aug.*, SPARTIANUS, *Severus*, 23.

³ *Script. Hist. Aug.*, JULIUS CAPITOLINUS, *Antoninus Pius*, 8, 2.

⁴ DIO CASSIUS, liii, 27.

⁵ AMMIANUS MARCELLINUS, xvi, 10, 14.

⁶ *Notizie degli scavi*, 1881, pp. 255-76; 1882, pp. 340-7, LANCIANI, *Relazione sugli scavi per lo isolamento del Pantheon*.

⁷ BELTRAMI, *Il Pantheon*, pp. 21-32, 71, 72.

alternately larger and smaller. The former are set on the axes and diagonals of the rotunda; the latter correspond to those parts of the internal circumference wall which are not recessed but solid.

These larger relieving arches correspond to arched chambers, alternately larger and smaller, divided internally by a cross-wall which ties the attic of the drum to the dome and strengthen the latter (fig. 136). These chambers, which take the place of the ordinary solid backing of Roman domes, are divided alternately into three and two compartments which communicate; and each one is lighted by a window, except the one opposite to the entrance, which has three

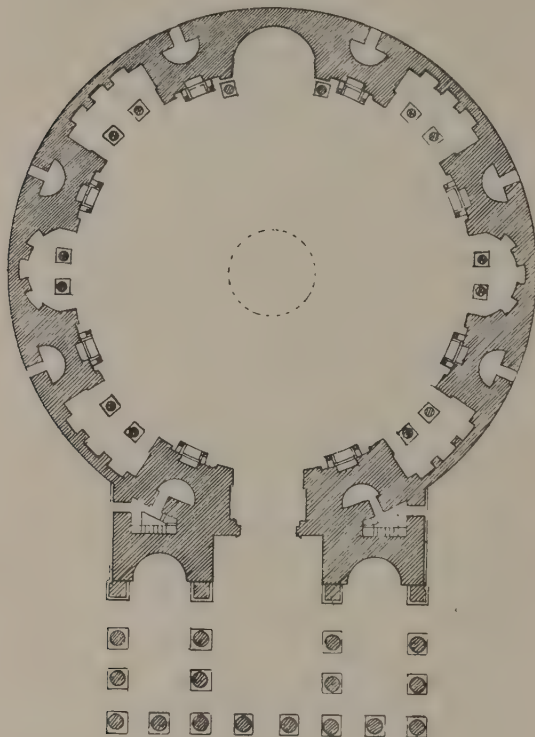


Fig. 138. Pantheon. Plan : ground floor

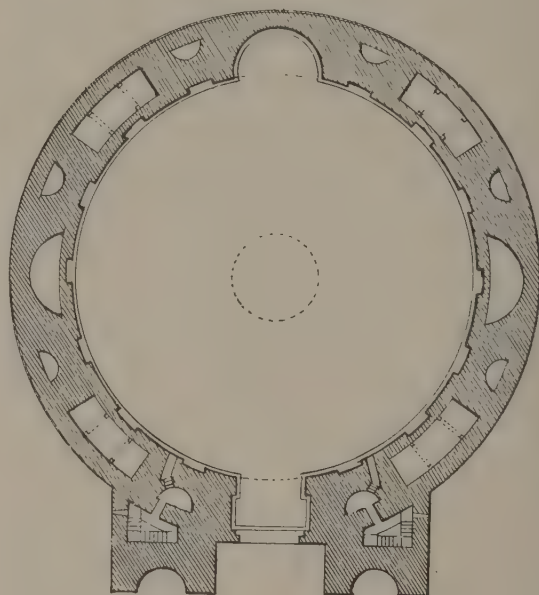


Fig. 139. Pantheon. Plan : middle story

openings. Access was obtained to them from a service gallery or balcony, of which there survive some fragments of the marble slabs supported by the cornice which runs outside at the level of the floor of the chambers : a fact which has not been noticed before (fig. 135).

This device is quite original, and when the actual chambers are seen they recall the blank arcades which were the precursors of the first open galleries round the apses of medieval churches. In Roman domes before this the external drum presents as it rises, up to the point where the thrust of the dome is greatest, a solid mass which is continuous with the dome, giving strength to the haunches of the latter ; but they have no system of buttressing.

In the middle tier or story the larger arches have three rings, as they had to support a heavier weight of material while construction and settlement were

going on. The smaller ones have only two. The former correspond to the chambers, alternately of trapezoidal and curvilinear outline, above the recesses or chapels masked by the architraved colonnades in the interior of the rotunda. The latter, on the other hand, correspond to the semicircular vaulted apsidal cells reserved in the upper part of the solid or unrecessed portions of the internal circumference-wall in order to save material; with two exceptions, viz. those which correspond to the stairs on either side of the entrance, which were made for service purposes (figs. 138, 139).

The relieving arches of the ground tier, which are not continuous, are set at the vertical axes of the smaller arches in the two upper tiers, and have one ring only. They cover the entrances to the semicircular vaulted spaces at the bottom of the solid parts of the wall mentioned above, and correspond to them. These spaces, perhaps suggested by the chambers in the circumference of Etruscan tombs, such as one at Corneto Tarquinia, described by Canina¹ (fig. 137), were not left merely in order to economize material, as Carlo Fontana (1634-1741) stated,² but also for service purposes, for there are means of access to them, and they are decorated with a cornice at the impost of the vault.

Coming to the interior, the vast dome, 43.20 m. (144 ft.) in diameter, which is the same as the height of the central opening above the pavement, is lightened by sunk panels or coffers, the ribs between them forming a latticed framework of great thickness, while the sunk panels tend to diminish considerably the amount of material and, in consequence, the weight and thrust as well (fig. 140).

At its base appears a discontinuous series of eight large relieving arches of two rings, which are connected: vertically with the six colonnaded recesses of the ground floor, the entrance opening, and the apse; horizontally with the large relieving arches on the exterior of the attic of the drum. These arches do not follow exactly the curve of the vault, but gradually diverge from it as they rise, and were designed to discharge the vertical weight of the lower part of the dome on to the solid parts of the circumference-wall of the drum inside (fig. 141).

The four large relieving arches above the trapezoidal colonnaded recesses

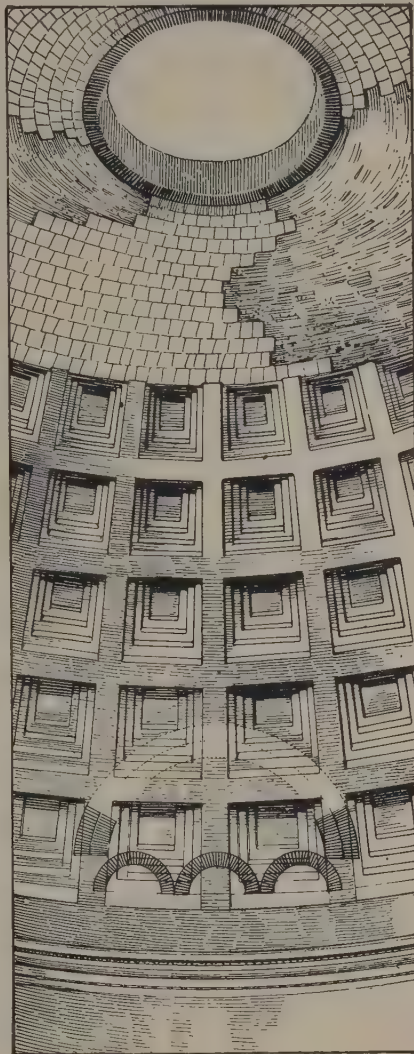


Fig. 140. Pantheon. Construction of the dome

¹ *L'antica Etruria marittima*, vol. ii, pp. 64-6, tav. xxxix.

² *Templum Vaticanum*, p. 457.

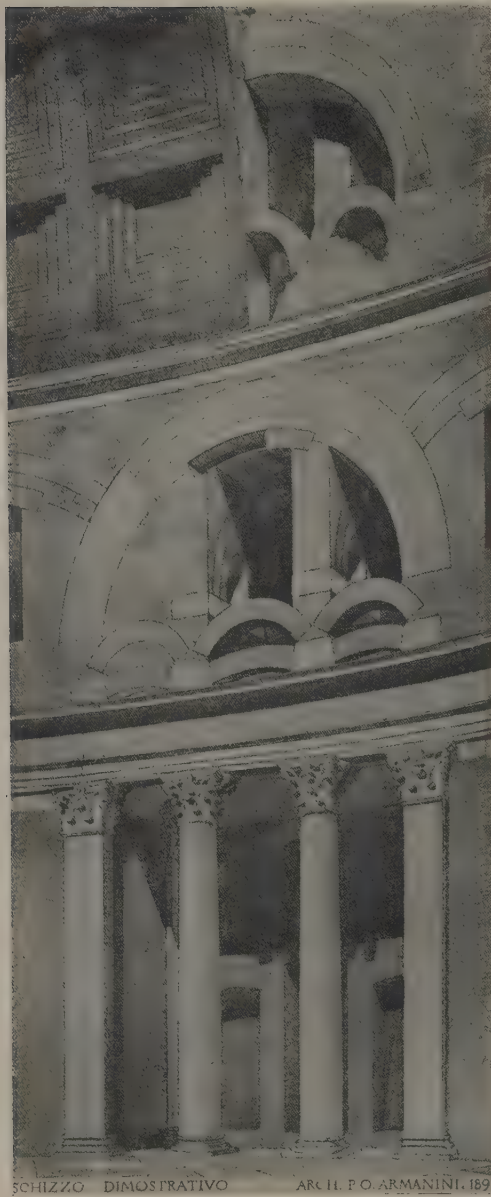


Fig. 141

Pantheon. Construction of the drum and dome
(From BELTRAMI, *Il Pantheon*, tav. iv)

white and black sort may be found, for instance, at Grottarossa on the Via Flaminia.

¹ *Dei Diritti del Principato sugli antichi edifizii pubblici sacri e profani in occasione del Pantheon di M. Agrippa*, p. 113.

enclose three smaller arches in each case, the axes of their imposts corresponding to the axes of the columns in the colonnades below.

The intrados of the dome, to judge by the portion examined in 1892, which extended only 7 m. (about 23 ft.) above the impost cornice of the dome, consists of courses of bricks arranged in horizontal rings slightly inclined inwards, with bonding courses of large tiles at intervals, and following the profile of the coffering. From this it may be inferred that the whole of the intrados is treated in the same way.

The intrados of a vault entirely constructed of courses of small oblong blocks set on a curve would have been nothing new in Roman architecture, for an early example may be seen in the Porticus Aemilia (174 B.C.). Nor was there any novelty in a vault wholly built of bricks, for we saw one in the columbarium of the freedmen of Livia. In the remains of buildings which come against the back of the Pantheon (the brick-stamps belong to the decade 117-127) may be seen high up a barrel-vault formed of courses of large tiles set on a radius.

The intrados is coated with concrete composed of volcanic scoriae, as was stated by Fea (1753-1834),¹ and again by Canina.²

So far as I know, this is the oldest Roman vault in existence in which pumice stone was used systematically on account of its lightness. The Romans do not seem to have used it in the time of Vitruvius, who calls it 'spongia sive pumex Pompeianus'.³ We cannot say whether it came by sea from Campania, or simply from the neighbourhood of Rome, where more or less porous scoriae of the kind are to be found, thrown out of the craters of Latium and the region of the lake of Bracciano. A fair amount of both the

² *Architettura Romana*, vol. i, p. 97.

³ VITRUVIUS, ii, 6, 2.

It is not known whether other means of relief were adopted in the part where the curve of the dome became more pronounced. Those which are to be seen below the central opening (which is quite 8.90 m. or about 30 ft. in diameter) in the drawings published by Canina are the work of the imagination.¹

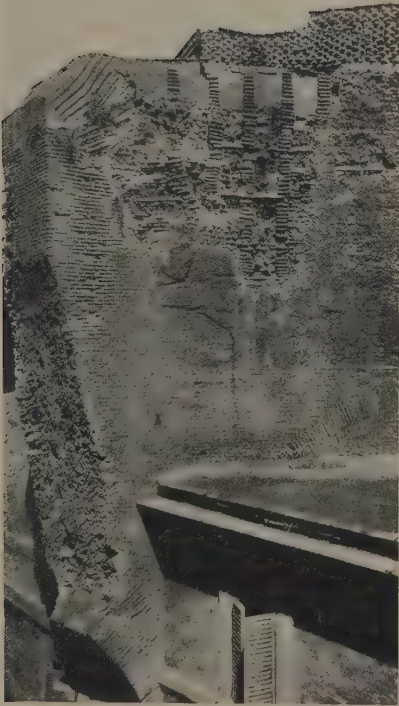


Fig. 142

Ruins of the Thermae of Agrippa : Via
dell' Arco della Ciambella, Rome

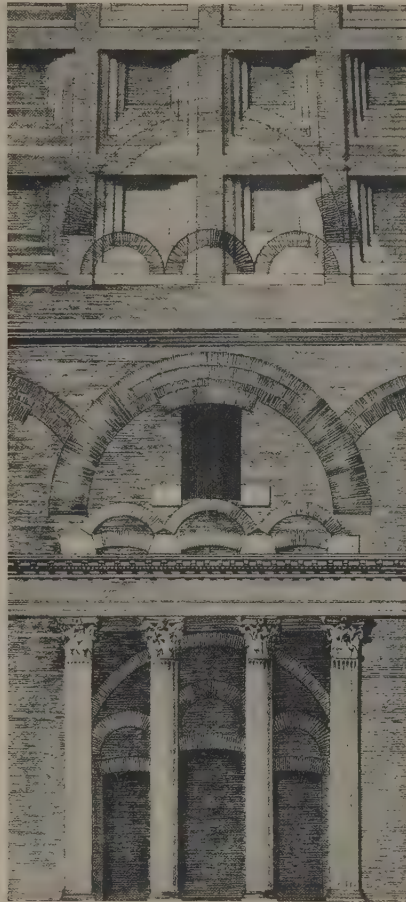


Fig. 143

Pantheon. Relieving arches

As will be seen, the dome of Hadrian's rotunda is very far from possessing the complex system (ingenious but imaginary) of arches, concentric rings, and meridian ribs, invented by Piranesi (1720-1778),² and accepted by some of the greatest writers on ancient architecture.

At this point I may note that one of the three essential elements of that

¹ *Architettura Romana*, vol. ii, tav. xlix ;
i, p. 97.

² *Raccolta de' Templi antichi*, parte ii, tav.

xxviii. [Reproduced in BELTRAMI, *Il Pantheon*,
pp. 23-5.]

system, the compartmented or box ribs, had not yet been used for domes when the Pantheon was built. In the time of Hadrian there were only used in hemispherical vaults simple irregular intermediate lines of large tiles, as may be seen in the apse of the frigidarium in the *Thermae of Agrippa* as rebuilt by Hadrian.

The very large number of Roman vaults, which I have seen with my own eyes, enables me to state that this method of reinforcement was not introduced into domes before the third century. The earliest example must be the dome of the calidarium in the *Thermae of Agrippa* as rebuilt by Alexander Severus, to which the important ruins in the *Via dell'Arco della Ciambella* belong¹ (fig. 142). It was from this dome probably that Piranesi borrowed the idea of the ribs which he gave to Hadrian's Pantheon.

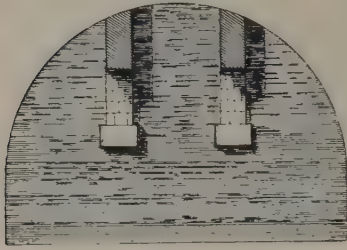


Fig. 144
Pantheon. Corbels of arches
in the trapezoidal chambers

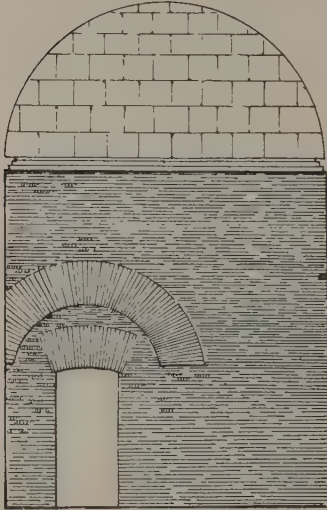


Fig. 145. Pantheon. Section
of one of the apsidal cells

Upon the cornice above the colonnaded recesses, and also upon that which separates the drum from the dome in the interior, ran a railed-in gallery reached by two small doors. The holes for the lead fixing of the railing are still to be seen. These service galleries (one of which, viz. that at the base of the vault, was noticed by Isabelle²) are earlier by some centuries than the similar facilities in Eastern domes.

Below the cornice the drum has a continuous series of relieving arches, in which the triple or double rings are strengthened by a portion of an arch inserted under the intrados of the lowest ring (fig. 143).

Each of the larger semicircular arches is connected, above, with one of the large discontinuous arches of the dome; below, with the chamber above the colonnaded recess. These chambers, alternately curvilinear and trapezoidal in shape, are roofed high up by a domical and a barrel-vault respectively, relieved by open transverse arches (fig. 141).

Each of the trapezoidal chambers is divided into three by two cross-walls set on the meridian lines passing through the axes of the columns below, and therefore standing in relation to the triplets of small arches at the base of the dome. The weight of these walls, which were intended to act as buttresses

and to unite the external and internal circumference walls, was discharged on to the columns below by the aid of semicircular open arches sprung from corbel supports (fig. 144). The corbel supports which are to be seen in the oratory of Giulio Saliasco and in the chapel belonging to the Congregation of the Virtuosi of the Pantheon,³ an entrance to which was made by cutting

¹ PIRANESI, *Il Campo Marzio*, tav. xxiv.

² *Les édifices circulaires*, p. 41.

³ [The chapel of the Virtuosi occupies the trapezoidal chamber on the middle story, im-

mediately to the left of the principal entrance (fig. 139). The oratory is above in the attic story.]

through one of the solid walls of the rotunda, have been altered by giving them a new contour.

In the same way the weight of the wall which closes the chamber on the side towards the interior of the building was prevented from crushing the architrave of the colonnade below by means of three small arches and three slightly curved flat arches springing from marble blocks (fig. 143). From all this it is clear that there is no truth in the idea which has been put forward that the said columns have no place in the essential construction and static system of the building.¹

The semicircular chambers, on the other hand, rise without any break up to just below the level of the impost of the dome. This may easily be verified by looking at the one which contains the tomb of Humbert I.

The back wall of each of the colonnaded recesses has a large relieving arch enclosing three smaller ones, each with its slightly curved flat arch, which cover as many niches (fig. 143). These niches are set on the vertical axis which passes through the window (flanked by two niches on the inside) of the corresponding tripartite chamber in the attic story of the drum.

In the core of each of the solid walls or piers between the colonnaded recesses, the apse, and the entrance, are reserved, as we noticed, for the whole height of the internal drum, two apsidal cells, one above the other, covered by domical vaults which show on the intrados a facing of tiles laid flat (fig. 145), and must be constructed of bricks in the lower part and concrete in the upper, like the domical vault in the two great niches of the portico (fig. 146). The two upper apsidal cells, corresponding to the stairs on either side of the entrance, are lighted in either case by a loophole. The attic of the rectangular projection or pronaos contains six barrel-vaulted rooms, two of which have apsidal ends. The staircases taken out of the sides of this projecting part of the building are the forerunners of the later towers flanking church fronts.

The Pantheon, while so imposing in its dimensions, and apparently so simple in construction, is the most complex, and at the same time the most thought-out example of a circular vaulted building of coherent material produced in the ancient world up to the time of Hadrian.

And its organic framework or skeleton, the like of which is not to be found before or after it, though based on the principle of the relieving arch developed by Rabirius in the temple of Augustus, is so original and advanced an application of that principle (here used for the first time in a vault) in association with new elements, that it may be described as the work of a man of genius. Isabelle (1800-1880), indeed, described him as a great genius.²

The effect of this framework was to minimize the defects and damage produced by settlement, which are inherent in a structure composed of bricks, not always

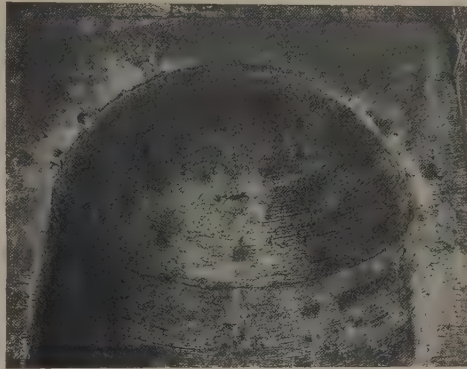


Fig. 146. Pantheon. Portico. Great niche on the left

¹ NARDINI DESPOTTI MOSPIGNOTTI, *Il Duomo di San Giovanni oggi Battistero di*

Firenze, p. 14.

² ISABELLE, *op. cit.*, p. 44.

of the same substance and hardness, set on beds of mortar which are not absolutely level, bonded into a great mass of concrete formed of various materials not all of uniform texture, and therefore subject to all sorts of pressure, shrinkage, and, consequently, to fissures. It also served to reduce the gravity of injuries due to external causes such as earthquakes and lightning attracted by the great mass of metal on the roof. As a matter of fact the injuries, fissures, and rents to be found in the structure (one of them goes right through the thickness of the dome) never extend vertically for the whole height of the building, as they are diverted or stopped, or reduced to mere cracks by the tiers of relieving arches.



Fig. 147. Tivoli. Villa of Hadrian. Interior of the vestibule, 'Piazza d' Oro'

It is therefore not easy to understand why its author did not send to Apollodorus the designs of this wonderful and superb structure, in its essential qualities unique in the ancient world, instead of those for the temple of Venus and Rome. They might well have provided the architect from Damascus with a subject of serious study, with lessons by which he might have profited, and with a tangible demonstration of what high achievements in construction and statics, and of what daring conceptions a Roman emperor-architect and Roman builders were capable.

It is astonishing how some writers persist in associating the buildings of Hadrian with the services rendered to him by Greek architects. One may ask where are the traces which these legendary agents have left in the emperor's buildings, Roman both in their essence and in their expression? His dislike of the eminent but self-important Graeco-Syrian architect would not have been likely to incline him to employ Greek or Hellenistic artists; and it is a fact that Decrianus (as Spartianus gives the name,¹ not 'Demetrianus' derived from 'Demetrius' in

¹ *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 19, 12.

order to label him as a Greek), the engineer-architect and master-builder who moved the Colossus of Nero for him, bore a Latin name formed from 'Decrius'. This Decrianus must have stood in much the same relation to Hadrian as Isidorus of Miletus did to Anthemius of Tralles when St. Sophia at Constantinople was being built. That is to say, just as Anthemius was the author of the designs for the structure—for, as others agree,¹ surely his was the brain that worked out the plan of Santa Sophia—while the elder Isidorus was the engineer and master-builder;² so Hadrian will have thought out the plans for his buildings, and Decrianus will have carried them out.

THE TEMPLE OF VENUS AND ROMA was dedicated in 135.³ Antoninus Pius must have put some finishing touches to it, for it is figured on some of his coins. In describing it we assume that in the restoration by Maxentius, after the building had been devastated by fire, the plan of Hadrian's twin 'cellae' was retained.

The great novelty of the structure was that it consisted of two temples of basilica form, with their apses back to back, and vaulted (see figs. 260, 262). No wonder that this unique combination encountered the hostile and contemptuous criticism of Apollodorus; though if it was stated in the form related by Dio Cassius, it would seem to have been due rather to malice than to sound reason, for it is not convincing. There was bad blood between Hadrian and Apollodorus. The emperor-architect had not forgotten the insult of the Graeco-Syrian architect, who, in Trajan's presence, went the length of telling him in a supercilious way to 'go away and paint pumpkins'.⁴ There is nothing surprising in this in view of what we know about the self-sufficiency of these races, as Antoninus Pius and Marcus Aurelius found out later.⁵

Besides, Apollodorus, who had been brought up in the tradition of temples and basilicas with wooden roofs, would be sure to find the design and structure of Hadrian's temple wanting both in elegance and sobriety. This was not so much the quarrel of two rival architects as the clash of two rival schools, the Roman and the Greek or Hellenistic, which were at opposite poles from one another. On the one side there was the Roman school, the expression of a new nationality, robust, solid, practical, with a passion for conquest, for unification, for innovation. On the other was the Greek school, the representative of an ancient race,

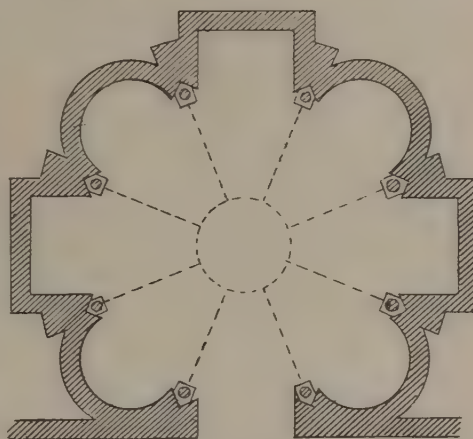


Fig. 148. Villa of Hadrian. Plan of the vestibule, 'Piazza d'Oro'

¹ BURY, *History of the later Roman Empire* (London, 1923), vol. ii, p. 49.

² *Corpus Script. Hist. Byz.*, AGATHIAS, *Hist.*, v, 6, 7, 9. PROCOPIUS, *De aedificiis*, i, 1. PAULUS SILENTIARIUS, *Descriptio S. Sophiae*, p. 20.

³ MIGNE, *Patr. lat.*, vol. xxvii, col. 468, HIERONYMUS, *Eusebii Chronica*. [FOTHERING-

HAM, *op. cit.*, p. 282.] *Mon. Germ. Hist., Auctores Antiquissimi, Chronica Minora*, vol. ii, p. 142, CASSIODORUS, *Chronica*.

⁴ DIO CASSIUS, lxi, 4.

⁵ *Script. Hist. Aug.*, CAPITOLINUS, *Antoninus Pius*, 10, 4. PHILOSTRATUS, *Vitae Sophistarum (Polemon)*, i, 25, p. 534.

restless and unstable, yet permeated by an exquisite sense of harmony and beauty. It was the battle of two styles: the one in the main an architecture of palaces and baths, exhibiting plans of great variety and complexity, based on the combination, stability, and equilibrium of its vaulted roofs, making durability combined with economy its principal aim, deriving its vitality from itself rather than from the aid of the minor sister-arts, with a capacity for endless development and the creation of new styles. The other was above all a temple-architecture, advanced and carried by the Greeks to a superlative degree of beauty, but now fossilized, and so incapable of fresh methods of treatment.

HADRIAN'S VILLA AT TIVOLI (Villa Tiburtina). The groups of edifices composing the villa which Spartianus describes as a wonderful structure,¹ but to



Fig. 149. Villa of Hadrian. Exterior of the vestibule

which there are such slight references in ancient writers,² as late as the sixteenth century, ruined as they were, excited the admiration of Pirro Ligorio,³ who was commissioned by Cardinal Ippolito d'Este (c. 1551-1560) to make a plan of them. The villa was erected between the years 125 and 135,⁴ and in it Hadrian reproduced the names of the places and buildings which had made the greatest impression on him in his lengthy progresses. The originality of its treatment of problems of construction and equilibrium in which it is so rich make it more than worthy of the author of the Pantheon. Among these novelties we may call special attention to the following:

I. The vestibule of the 'Piazza d'Oro'. The plan is derived from two of the front rooms which we

saw in the 'Domus Augustana' and in the palace of Domitian on the Palatine. It forms an octagon, with arched recesses alternately round and rectangular (figs. 147, 148). Originally the re-entrant angles of the interior contained shafts from which sprang the lunette-arches carrying the compartments of the segmented dome, which is pierced at the top by a round opening, and also relieving the heads of the recesses below. On the other hand, at the external projecting angles there are piers on which arches were turned at the impost of the dome in order to strengthen its haunches (fig. 149). The existence of this resistant framework of arches allowed the side-walls in between to be no more than half a metre (about 1 ft. 8 in.) thick; thus obtaining the double advantage of economy in expense and elegance and elasticity in the structure.

¹ *Script. Hist. Aug.*, SPARTIANUS, *Hadrianus*, 26, 5.

² GRAEVIUS, *Thesaurus Antiquitatum Italiae*, vol. viii, ANTONIUS DEL RE, *Antiquitates Tiburtinae, Villa Hadriani imperatoris*.

³ GRAEVIUS, *ibid.*, PYRRHUS LIGORIUS, *Descriptio Villae Hadrianae*.

⁴ LANCIANI, REINA, BARBIERI, *La Villa Adriana, Guida e descrizione, Rilievo planimetrico e altimetrico*.

This vestibule seems to have provided a starting-point for the creation of round buildings in sections of undulating outline;¹ and there is no earlier edifice showing such a definite effort to attain a lightness of effect which may help one to forget the tyranny of the material, such a scientific development of the organic structure, such sound and advanced principles of concentrating the static action



Fig. 150. Top of a shrine from Todi
Vatican, Galleria Lapidaria

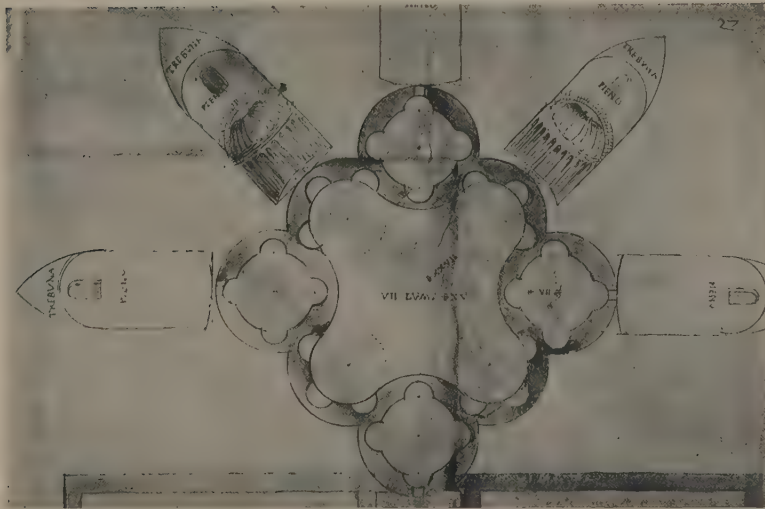


Fig. 151. Drawing by Giuliano da Sangallo of a thermal building at Baiae

of the whole structure, and of keeping a balance between the elements of pressure and relief. The whole surface of the dome is divided into segments, a design which has its origin in apsidal recesses with shell-shaped heads like those shown in Bianchini's view of the barrel-vaulted Columbarium of the freedmen of the Empress Livia on the Via Appia Antica (see fig. 29, p. 30); or else in the heads of niches such as that of a shrine from Todi,² now in the Galleria Lapidaria of the Vatican (fig. 150).

¹ RIVOIRA, *Moslem Architecture*, p. 67.

² MARUCCHI, *Guida speciale della Galleria*

Lapidaria del Museo Vaticano (1912), section
xxi, p. 32.

This vestibule is also the earliest example of a round building embellished with blank arcading—a feature of Roman origin.¹ The Greeks had previously used such arcading merely in construction, as in the wall on the south of the Acropolis at Athens, belonging to the time of Eumenes II, King of Pergamum (197–159 B.C.).² In Hadrian's villa it is used both outside and inside. Another building embellished internally with blank arcading is the singular thermal structure at Baiae, shown in a drawing of Giuliano da Sangallo's (fig. 151) in the Vatican Library (Barberini MS. Lat. 4424, f. 7): a structure whose sinuous outline is copied directly from that of another building near the 'Piazza d'Oro' in Hadrian's Villa (fig. 152), as has been pointed out elsewhere.³ This, too, may be due to Hadrian, whose reign was one of the most flourishing periods of the famous watering-place.

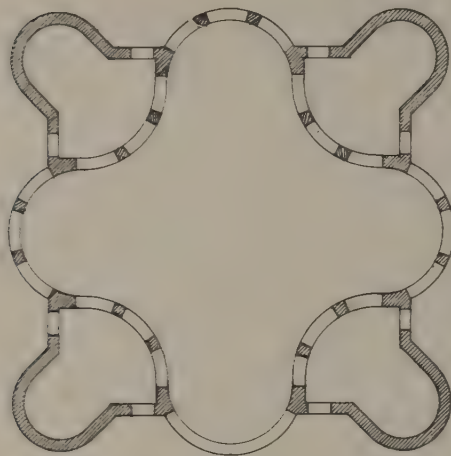


Fig. 152. Villa of Hadrian. Plan of a hall with sinuous outline

The building at Baiae is also notable as being the earliest example of a dome in masonry with its drum pierced by windows.

The dome of the vestibule connects it with another Hadrianic building: the so-called 'Tempio di Siepe' in the Campus Martius at Rome (fig. 153), the plan and elevation of which have been recorded.⁴ The plan shows a square block hollowed out into four niches at the angles, and an elongated apse (fig. 154), and is about four centuries older than the central-planned cathedral of Ezra (515–516) (fig. 155). The dome itself was pierced by round openings, again the earliest specimens of their kind; and we also note the heavy, overloaded architraves below it, a fashion which came in under Hadrian.

Interesting examples of segmented domes and half-domes may be seen: in the remains of a bathroom in the Villa of the Gordians near Rome (238–244); in the ruins of a larger one at Otricoli (fig. 156)⁵ (whence came the splendid mosaic in the Sala Rotonda of the Museo Pio-Clementino in the Vatican⁶) belonging to the time of Caracalla (211–217) or Heliogabalus (218–222);⁷ in a sketch by Baldassare Peruzzi (1480–1536) of the section of a bathroom⁸ (fig. 157); in another sketch by the same hand of a round chamber;⁹ in a third sketch of a bathroom at Viterbo, described as 'a temple used as a bath', by Giuliano da San Gallo.¹⁰ In the last case attention may be called to the portion of architrave set on the capitals of the detached wall-columns like a pulvin or impost-block.

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 23, 25.

² E.A. GARDNER, *Ancient Athens*, pp. 484, 485.

³ HUELSEN, *Il libro di Giuliano da Sangallo*, p. 13.

⁴ RIVOIRA, *Moslem Architecture*, pp. 67, 69, 70.

⁵ GUATTANI, *Monumenti antichi inediti* (Roma, 1784), pp. lx–lxii.

⁶ NOGARA, *I mosaici antichi del Vaticano e del Laterano*, pp. 21–4.

⁷ BORGHESI, *Œuvres*, vol. iii, pp. 109–11.

⁸ FERRI, *Indice geografico-analitico dei disegni di Architettura nella R. Galleria degli Uffizi in Firenze*, no. 158, p. 129. RIVOIRA, *Lombardic Architecture*, vol. i, p. 67.

⁹ Siena, Biblioteca Comunale: *Taccuino di schizzi e disegni autografi di BALDASSARE PERUZZI*, S. IV, 7, fol. 36.

¹⁰ *Ibid.*, *Taccuino autografo di Giuliano da San Gallo*, S. IV, 8, fol. 8.

II. The half-dome of the Serapeum (fig. 158) segmented alternately with flat and concave compartments: the earliest certainly dated specimen of the kind in masonry, and the forerunner of the similarly varied outline of the dome of SS. Sergius and Bacchus at Constantinople (c. 527) (fig. 319).¹ It recalls the dome of the Nymphaeum in the Gardens of Sallust (figs. 104, 106).

III. Cross-vaults resting on corbelled supports. These are the earliest specimens of the kind. In the Large Baths a vault of this sort may be seen springing from angle-corbels shaped like pulvins in the part that is visible, and stuccoed and painted all over (fig. 159). The cross-vault of the central room also springs



Fig. 153. Rome, Campus Martius. The 'Tempio di Siepe'
(From GIOVANNOLI, *Vedute degli antichi vestigj di Roma*, fol. 39)

from corbels, but these originally were supported by columns, as a drawing by San Gallo shows.²

IV. The embellishment of exteriors with niches framed by columns supported on brackets, alternating with recesses, as, for instance, on the northern face of the Small Baths. This motive attained its fullest expression on the principal front of the Baths of Diocletian at Rome. An interesting drawing of it by an unknown artist of the fifteenth century is in existence.³

These Small Baths are remarkable for the singular design and shape of the rooms—square, rectangular, cruciform, circular, elliptical, polygonal; roofed by barrel-vaults, lunette barrel-vaults, cross-vaults, domes, semi-domes; their stability being in every case solely the result of the interpenetration and reciprocal thrusts of the rooms themselves.

V. The conical or hood-shaped, or squinch-arched raccords or pendentives.

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 81, 82.

fol. 39, pp. 55, 56.

² HUELSEN, *Il libro di Giuliano da Sangallo*,

³ BARTOLI, *I monumenti antichi di Roma nei disegni degli Uffizi di Firenze*, vol. i, tav. i.

In the Large Baths the thrusts of the calidarium and of an adjoining barrel-vaulted room are met by a hood-shaped pendentive (fig. 160). It contains in embryo the idea of the Campanian hood-shaped pendentive, the earliest known example of which, whether in the East or West, is to be found in San Giovanni in Fonte (fifth century) adjoining the Cathedral of Naples, as I have demonstrated elsewhere,¹ and as is now accepted.² From this was developed later the compound Campano-Lombardic pendentive, the archetype of which in an early form exists in the remains of an undeveloped compound pendentive on the exterior of the 'Piazza d'Oro' quite close to the vestibule (fig. 161).³ I can remember when it was in a less ruined condition than now.

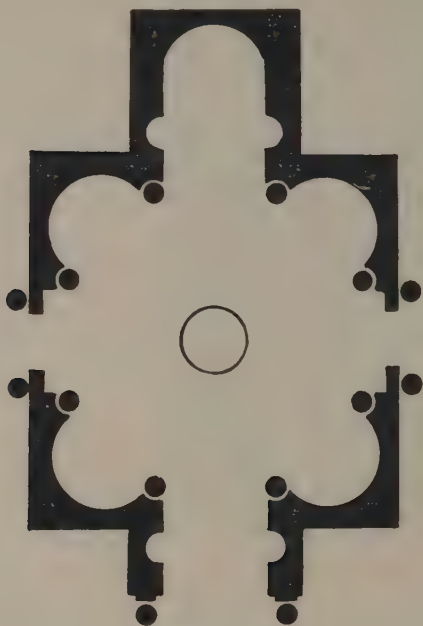


Fig. 154

Rome. Plan of the 'Tempio di Siepe'

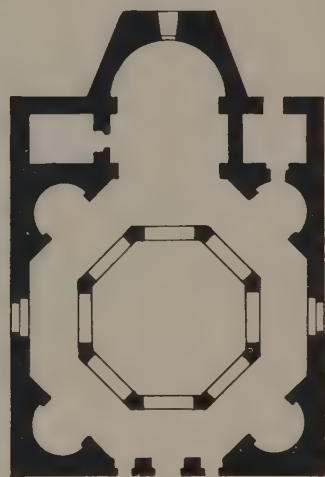


Fig. 155

Plan of the Cathedral, Ezra

In these Baths stability was secured, not only by the deliberate grouping of the rooms, but also by means of buttresses at the outer angles, where the thrust of the cross-vaulting is not countered by barrel-vaults.

VI. The three-lobed or tri-apsidal edifice between the Poecile and the Small Baths (fig. 162).⁴ This important structure set the fashion for sepulchral monuments of simple three-lobed plan, such as, for instance, the so-called temple of Jupiter at the fourth milestone on the Via Appia Antica ;⁵ really a tomb of the third century, as is shown by its form and construction. Its plan was apparently recorded by G. Battista Montano, whose drawings were edited by Soria (1581-

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 191-9; *Moslem Architecture*, pp. 127-35.

² DE LASTEYRIE, *L'Architecture religieuse en France à l'époque romane*, pp. 270-2.

³ RIVOIRA, *Lombardic Architecture*, vol. i,

p. 192.

⁴ [Notizie degli scavi, 1922, p. 235. Boussois in *Mélanges*, vol. xxxiii, 1913, p. 261.]

⁵ CANINA, *Edifici*, vol. v, pp. 29, 30; vi, tav. xxiv.

1651).¹ Montano was a member of the Roman Academy of St. Luke between 1588 and 1594.²

From such buildings were derived in their turn (with the addition of nave-like prolongations) the small basilicas of a sepulchral character, both Pagan and Christian, such as the chapel or 'cella' of St. Symphorosa on the Via Tiburtina (third century);³ those in the Cemetery of Calixtus on the Appia Antica, which go by the names of St. Soteris and SS. Xystus and Caecilia (third century);⁴ the two standing near the north aisle of San Sebastiano on the same road; and other tombs illustrated by Montano.⁵ I append two examples of the last, as prototypes of the later Christian tri-apsidal basilicas⁶ (figs. 163, 164).



Fig. 156. Otricoli. Ruins of Baths

As bearing on the subject of ancient lobed buildings, it may be mentioned that Pirro Ligorio has preserved the plan of a very curious one near Rome which he calls a 'Bagno-Vivario', consisting of a square of four lobes each of which is tri-lobed.⁷ The four-lobed plan is also to be found in a tomb in the Vigna Casali on the right side of the Via Appia Antica, dating from the Flavian period; and here the central space is covered by a groined cross-vault.⁸ A miniature basilica in the Cemetery of St. Cyriacus on the road to Ostia has five lobes (fourth century).⁹

¹ *Raccolta de templi e sepolcri*, &c., tav. 8.

² R. ALBERTI, *Origine e progresso dell' Accademia del disegno, de Pittori, Scultori, et Architetti di Roma*.

³ *Gli Studi in Italia* (1878), pp. 665-80, 864-6; (1879), pp. 188-99, 435-69, STEVENSON, *La Basilica di S. Sinforosa*. *Bull. di Arch. Crist.*, 1878, pp. 75-81, tav. vi, STEVENSON, *La Basilica di S. Sinforosa*.

⁴ *Nuovo Bull. di Arch. Crist.*, 1908, pp. 157-95, tav. ix, MARUCCHI, *La Cella tricola detta di Santa Sotere*. WILPERT, *Die Paptgräber und die Cäciliengruft in der Katakomben des Hl.*

Kallistus, pp. 91-104.

⁵ *Scielta de varii tempietti*, tav. 40; *Raccolta de templi e sepolcri*, tavv. 4, 19.

⁶ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 276, 316; *Moslem Architecture*, p. 277.

⁷ Turin, Biblioteca del R. Archivio di Stato, *Opere originali*, PIRRO LIGORIO, vol. viii.

⁸ PIRANESI, *Le antichità Romane*, vol. ii, tavv. lv, lvi.

⁹ *Nuovo Bull. di Arch. Crist.*, 1916, pp. 101, 102, tav. x, SCHNEIDER, GRAZIOSI, *Scoperte del cimitero di S. Ciriaco sulla Via Ostiense*.

VII. The niche-pendentives. In the substructure of the Imperial Palace looking towards the Vale of Tempe the salient angle is replaced at the top by a straight piece of wall supported by means of a large arched niche (fig. 165). This expedient is a new idea, though connected (but for a different purpose)

with the one which we noticed in the two octagonal rooms of the 'Domus Augustana' on the Palatine.

VIII. Facings with horizontal courses of tufa blocks shaped like bricks (to economize the latter) alternating with brick courses. Among the many types of walling in the Villa (e.g. brick all through, or reticulate, or small oblong stones (figs. 166, 167, 168); mixed reticulate and brick (fig. 169); mixed stone and brick) attention may be called to the above, which was already known in Campania in the last years of the Republic, as is proved by the Porta Herculaneensis at Pompeii, built of courses of stone alternating with others of broken tiles, faced with plaster imitating masonry¹ (fig. 170). The work is of the best quality under Hadrian, but in the next century it shows some decline. The facings of the Nymphaeum in the Villa of the Quintilii on the Via Appia Antica, which not long ago was cleared of the rubbish and repaired,² exhibit courses of thin bricks alternating with small oblongs of tufa which are not perfectly true. It is evident that this Nymphaeum is an addition (of about the middle of the third century) to the rest of the Villa, which belongs to the age of Hadrian and the Antonines (138-193), and is wholly constructed with bricks of considerable thickness or else in reticulate with brick bonding

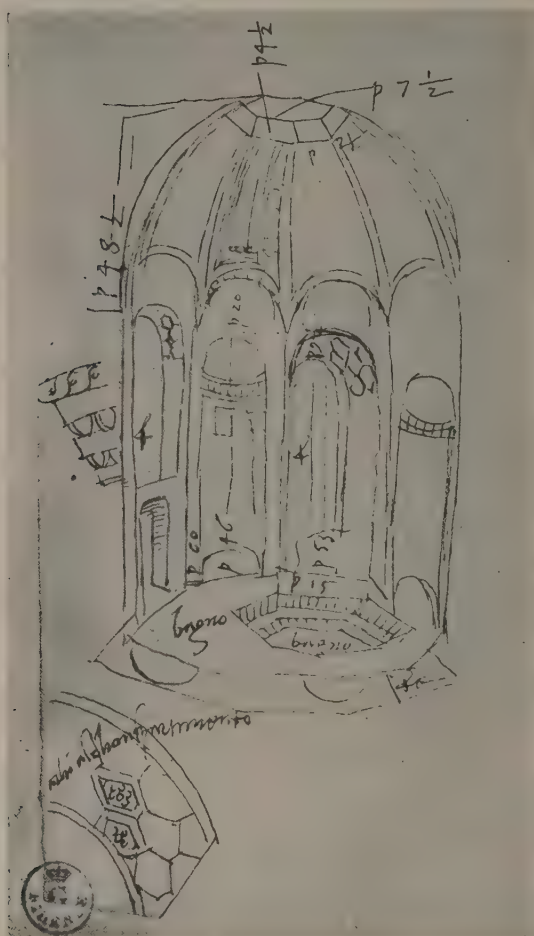


Fig. 157

Sketch of a bath-room by Baldassare Peruzzi

courses. In the time of Maxentius (306-312) we find it quite debased, the tufa being only roughly shaped as oblongs or squares, or even merely blocked out. This may be verified in the Circus of Maxentius and Romulus and the portico of the Mausoleum of Romulus on the Via Appia Antica.

This decadence seems almost to have come to a standstill in the fifth century, if one may trust the evidence of the scanty remains of the Basilica of St. Stephen

¹ MAU, *Pompeii in Leben und Kunst*, pp. 248, 249.

² *Bull. Comunale di Roma*, vol. xli (1913),

pp. 14-21, tavv. iv-vi, MUÑOZ, *Il Ninfeo della Villa dei Quintili*.

on the Via Latina, erected in the pontificate of St. Leo the Great (440-461). The bricks employed, however, were not made for the building, but are re-used. In the sixth century a further deterioration is apparent, both in the laying of the broken tiles and in the shaping of the small tufa blocks which form the alternate courses. This appears in the unrestored parts of the walls of the Constantinian Basilica of San Lorenzo in Campo Verano, which was entirely rebuilt by Pelagius II



Fig. 158. Villa of Hadrian. The Serapeum. (From PIRANESI)

(579-590).¹ As to the existing church, I may note that above ground it shows two periods of construction only, viz. to the east the work of Pelagius which replaced that of Constantine; to the west that of Honorius III (1216-1227).² Such is the evidence of the original outer walls, of the internal arrangements, and of the colonnades.

IX. The embellishment of exteriors with lesenas or pilaster-strips, which may be seen in a building above the so-called Praetorium (fig. 171).³

¹ DUCHESNE, *Le liber pontificalis*, vol. i, pp. 309, 310. *Studi Romani*, i (1913), pp. 37-52, PESARINI, *Contributo alla storia della Basilica di San Lorenzo*.

² DUCHESNE, *Le liber pontificalis*, vol. ii, p. 452.

³ RIVOIRA, *Lombardic Architecture*, vol. ii, p. 169.

Before leaving Hadrian's Villa I would observe that no group of monumental buildings, not even the Imperial *Thermae* of Rome, presents such a remarkable variety of forms both in plan and elevation. On this subject I will confine myself, in addition to what I have said about the Small Baths, to calling attention to a building of basilica type with a narthex in front, forming part of the Palace, the nave of which, separated from the aisles by columns, ends in a square apse, a feature which has been erroneously thought to be of Celtic or Anglo-Saxon origin.



Fig. 159. Villa of Hadrian. Corbel of vault in the Large Baths

Let us now pass to the consideration, in the first place, of a new feature in construction, forming a discovery of first-class importance; and secondly to the creation of a new type of edifice which makes its appearance in the reign of Hadrian.

I. The application of cellular ribs to the groins of cross-vaults.

Among the extensive ruins of the villa known as 'Sette Bassi' on the Via Latina near Rome (thought by Nibby and Lanciani to be a suburban Imperial domain¹), in the ground floor of a group of buildings belonging to the years 123-134, as shown by the brick-stamps² (which I have personally verified), is a room 7.60 m. (25 ft.) in width, now partly below the level of the soil, roofed with a cross-vault in which the sections of the web rest on massive semi-elliptical diagonal visible arches, constructed in compartments³ (fig. 172). In its present condition the webs, whether through damp or the fires made by the shepherds who seek the shelter of the ruins with their flocks and belongings during the winter, have partly lost their original surface and plastering; and the outer edges of the ribs have obviously suffered (fig. 173). These ribs, which are about 0.70 m. (2 ft. 4 in.) broad near the crown, and 0.60 m. (2 ft.) towards the base, terminate in a triangular point where they meet the angles of the room, project about 30 cm. (1 ft.) at the crown and 10 cm. (4 in.) at the spring, and have a regular outline, as they were intended to be partly visible; quite different from the ribs entirely incorporated in the masonry, which are used in sundry barrel-vaults of wide span in the northern part of the villa, and are very irregular in form. The ribs themselves are composed of two outer lines of bricks set on a curve, bonded at intervals with large tiles to regulate the mass and distribute the pressure. The hollow spaces between the outer lines, left in order to economize brick, are filled with lumps of tufa and broken tiles set by hand in concrete. In the outer lines grooves

¹ NIBBY, *Dintorni di Roma*, vol. iii, pp. 734-7. *École Française de Rome, Mélanges*, xi (1892), pp. 159-78, LANCIANI, *Quatre dessins inédits de la collection Destailleur*.

² *Papers of the British School at Rome*,

vol. iv (1907), pp. 97-112, ASHBY, *Classical Topography of the Roman Campagna*, III. The Villa called Sette Basi.

³ RIVOIRA, *Lombardic Architecture*, vol. i, p. 248.

were made to serve for the successive construction of the compartments of the vault cells, an anticipation of the rebates in the ribs of Lombardic cross-vaults on which the webs were to rest.

The original method of construction may be seen in the cryptoporticus close by, quite 4.70 m. (16 ft.) wide and devoid of square tiles on the intrados. Here



Fig. 160. Villa of Hadrian. Hood-shaped raccord in the Large Baths

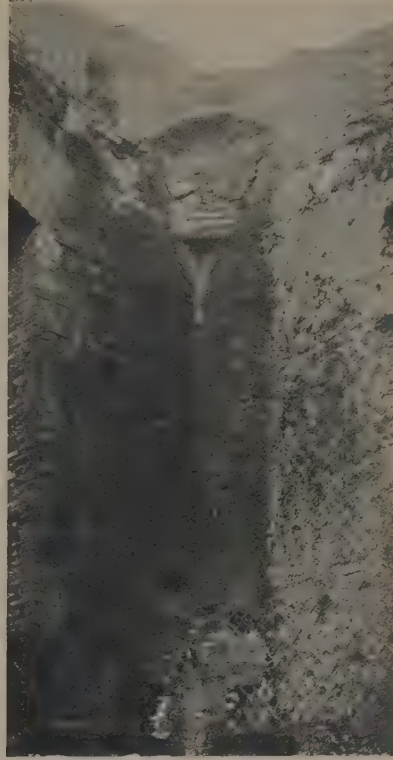


Fig. 161. Villa of Hadrian. 'Piazza d' Oro' Elementary compound pendentive

there are transverse visible arches, nearly 0.70 m. (2 ft. 4 in.) broad, constructed in compartments, with brick outer lines projecting 30 cm. (1 ft.) at the crown and 10 cm. (4 in.) towards the impost. A single centering sufficed for the construction of these outer lines, being moved on as each successive arch was built. The vault-compartments rested on the rebate of the circumference wall and on the grooves of the ribs, and consisted of layers of tufa lumps with some fragments of tile and marble, set by hand irregularly, which towards the top tended to form concentric circles. Afterwards the whole was coated with plaster.

When I examined this cross-vault for the first time, in 1872, some portions still retained the plaster, and it was on this clear evidence that I made the drawings here reproduced (figs. 174, 175).

I ought here to mention an apparent anomaly, namely, that the other cross-vaults in the ground story of the villa in question, all of which are smaller than

the one which has ribs, have not got them and are faced on the inside with square tiles 20 or 30 cm. (8 or 12 in.) across when unbroken. They were evidently constructed in the following way. After the centering was made, two layers of tiles large and small were set, partly bonded into the concrete of the vault by means of bricks here and there set edgewise, over which was poured a good dose of lime to fill up the chinks, forming in this way a thick coating or belt which supported the vault above and required

lighter and slighter, and therefore less expensive, centering.

This difference of treatment was due to the following reasons. The use of ribs for the cross-vault of greatest span was naturally suggested by the greater weight which it had to bear as compared with the cross-vaults of lesser span. This weight was accidental, being due to the several cubic metres of water in the tank or basin of the tepidarium above. But these auxiliary supports must have had, in the architect's intention, a function not limited to the period when the masonry would be settling, but which would continue. And thus it was for a special statical reason that he decided to adopt in the cross-vault the compartment ribs of the barrel-vaults. The absence of any marks left by centering boards may be explained by the fact that the vault was reinforced by the diagonal arches, and by the use of a more permanent kind of centering.

The ribbed cross-vault of Sette Bassi does not really belong to any of the three categories illustrated by Choisy.¹ But it is related to one of

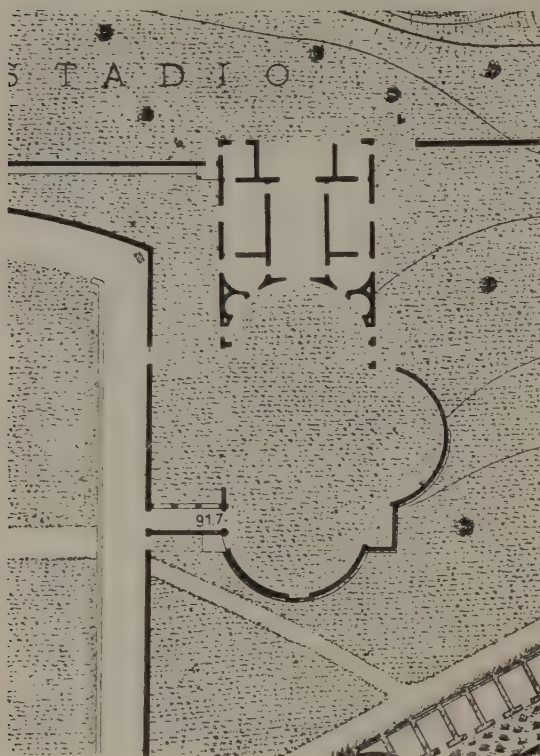


Fig. 162

Villa of Hadrian. Plan of three-lobed building
(From LANCIANI, REINA, BARBIERI, *La Villa Adriana*)

them, viz. the second, from which it differs by being partly visible. These categories concern: (1) the cross-vault with single 'chain' of brick forming the groins of the vault, a specimen of which exists in the so-called 'Pulvinar' of the palace of Septimius Severus on the Palatine; (2) cross-vaults with double chains flush with the webs of the vault, an example of which may be seen in the Janus Quadrifrons of the Forum Boarium (fig. 176), erected in the early years of the fourth century;² (3) cross-vaults with three parallel chains, one of which marks the line of intersection of the two barrel-vaults which compose it, while the other two follow the curve of the compartments, as may be seen in some of the substructions of the palace of Severus and in the Baths of Diocletian. In every case the vaulting was

¹ *L'Art de bâtir chez les Romains*, pp. 76-80, pls. vii, viii, ix.

² LANCIANI, *Ruins and Excavations*, pp. 520, 521.

examined by me close at hand, either while restoration was going on or from ladders.

The cross-vault of Sette Bassi, with its ribs derived from the ribs or visible arches of Roman barrel-vaults, is the earliest example of the kind that I have met with among the many vaults that I have seen up and down the provinces of the Roman Empire. This form of construction must have provided the suggestion for the Lombard Masters when in the eleventh century they built, for instance, San Flaviano at Montefiascone (1032), the cathedral of Aversa (1049-1078), the church of Santa Maria e San Sigismondo at Rivolta d'Adda (1088-1095), and Sant' Ambrogio at Milan (before 1098). For the invention of such a typical

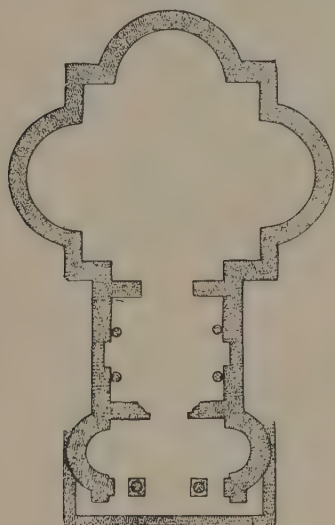


Fig. 163. Rome. Plan of an ancient three-lobed building

(From MONTANO, *Raccolta* &c., tav. 8)

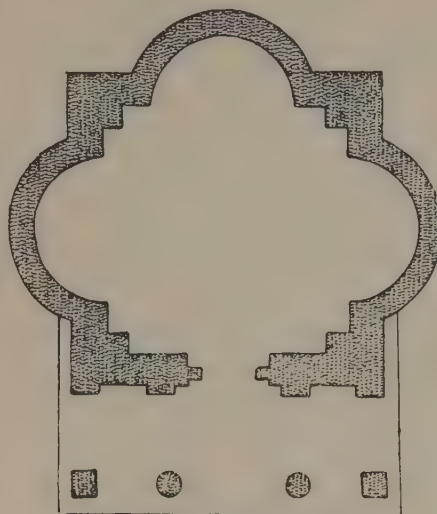


Fig. 164. Rome. Plan of an ancient three-lobed building

(From MONTANO, *Scielta* &c., tav. 16)

constructive, statical, and decorative element, regarded by Viollet-le-Duc as the most important of all discoveries in the art of construction,¹ cannot have sprung into existence fully developed, like Minerva in her panoply from the head of Jove, but on the contrary must have been the evolution of some preceding element related to it, an evolution which was completed in Italy, whence at a later date it crossed the Alps.²

The ribbed cross-vaults with permanent centering of the above-named churches were all built in one way, that is to say, by first setting rough wooden centering on the diagonal arches, next modelling up earth on this to give the form of the webs, and finally constructing the latter. The result was that after the removal of the centering boards the masonry of the vaulting was detached from the diagonal arches. This fact has been verified by others in the cases of Sant' Ambrogio³ and Rivolta d'Adda,⁴ and by myself at San Flaviano at Montefiascone

¹ *Dictionnaire de l'Architecture française du XI au XVI siècle*, vol. ix, p. 502.

² RIVOIRA, *Lombardic Architecture*, vol. i, pp. 210 ff., 248 ff., ii, pp. 225, 228, 235, 239 ff.

³ DE DARTEIN, *Étude sur l'architecture lombarde*, &c., p. 134.

⁴ NAVA, *La chiesa di Rivolta d'Adda*, pp. 13-16.

(where the eleventh-century vaults are of rubble concrete, not of squared stone as has been stated), and San Paolo at Aversa.

With regard to the last, I must repeat that the vaulting of the choir ambulatory with diagonal visible arches is everywhere original, and not the result of a restoration, as has been stated.¹ Without having recourse to testing, and presuming a serious acquaintance with medieval construction, it at once strikes an observer's eye that the frontal arches of the ancient radiating chapels, the arches in the choir which were originally open, and those of the cross-vaults, are all of one age. In every case the arches, where they do not spring directly from capitals, exhibit a uniform rude treatment at the impost which is formed of a simple abacus or moulded cornice. The clumsy, crowded effect of the whole is not due to reconstruction or alteration, but to the size of the vaulting ribs, which are fully 50 cm. (1 ft. 8 in.) broad and designed to carry vaults of about the same thickness, and also to the fact that this new and complex system of arching and vaulting was here applied to a bay forming part of a curve and was still in its beginnings, for we know that San Paolo was built subsequently to the foundation of Aversa (1030), and after the erection between 1049 and 1056 of the see, the first bishop of which was Azolino.



Fig. 165. Villa of Hadrian. Imperial Palace. Niche-shaped raccord

What distinguishes the Roman cross-vault as seen at Sette Bassi from the Lombardic is this. In the former the ribs have a semi-elliptical curve, are constructed in compartments, and are partially incorporated in the webs, and so form in that section an organic whole with them and are therefore no longer indispensable after the concrete has set, although still of some use as relieving the superincumbent weight; while the visible band still continued to function, in the form of a sub-arch, as a support to the incorporated portion. On the other hand, in the latter the diagonal arches are semicircular, forming a compact and independent member, the function of which is to receive the thrusts of the webs and discharge them on to the supports and buttresses.

The substitution of the semicircular curve for the Roman semi-elliptical one, a substitution already effected by Julianus Argentarius in the groined cross-vault of the sanctuary in San Vitale at Ravenna, made the construction simpler, and reduced the bulk of the supports.

With regard to the Lombardic vault, an attempt has been made to explain its origin by the necessity for economy in the use of centering, owing to a scarcity of timber. Now, to cite only one case among many, around Milan, where the

¹ SCHULZ, *Denkmäler der Kunst des Mittelalters in Unteritalien*, vol. ii, pp. 189-93. BERTAUX, *L'art dans l'Italie méridionale*,

pp. 327-9. [RIVOIRA, *Lombardic Architecture*, vol. i, p. 222.]

Sant' Ambrogio that we know, with its ponderous ribbed cross-vaulting, had been erected before 1098, there were districts which grew timber of a size required for public works; and there is historical evidence for this from the fifth century down to at least the end of the thirteenth. This information I had from



Fig. 166

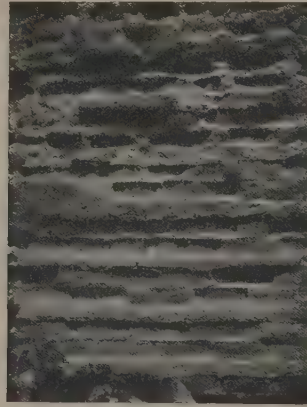


Fig. 167

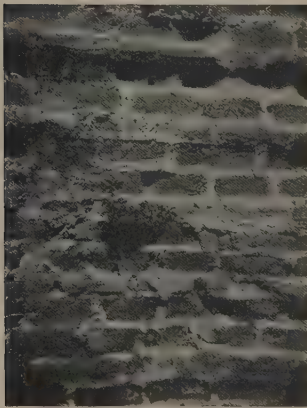


Fig. 168



Fig. 169

Villa of Hadrian. Examples of walling

Figs. 166, 167, 168, from the 'Torre di Timone'. Fig. 169 from the Large Baths

Mgr. Marco Magistretti.¹ Besides, the same is true of Lombardy generally, for the words 'silva', 'cerretum', 'castanetum', occur again and again in numerous deeds of gift, &c., from the eighth century onwards.² So in the Passion of St. Victor,³ compiled not later than the sixth century, we read that the saint

¹ [MGR. MAGISTRETTI, Canon of Milan Cathedral and President of the Curators of the Ambrosian Library (died 1921), wrote much on the ecclesiastical antiquities of Lombardy. Bibliography in *Archivio Storico Lombardo*, xlix

(1922), 206-12.]

² *Monumenta Historiae Patriae, Codex diplomaticus Langobardiae*, vol. xiii, Chartae saec. viii, ix, x.

³ *Acta Sanctorum*, May, vol. ii, p. 290.

was beheaded at the gates of Milan: 'Maximianus imperator . . . iussit eis ut duceretur ad silvulam quae ad Ulmos vocatur', which implies that there were other woods in the environs of the city. And in a bull of Innocent II (1139) in favour of the abbot of Chiaravalle Milanese, there is a confirmation of the properties of the abbey, viz. land, pastures, woods, waters, and all other possessions cultivated or uncultivated.¹ The abbey church, erected in 1135, was largely rebuilt about the end of the thirteenth century, and underwent various restorations and alterations between the fifteenth and eighteenth centuries.² Again,



Fig. 170. Pompeii. Porta Herculaneensis

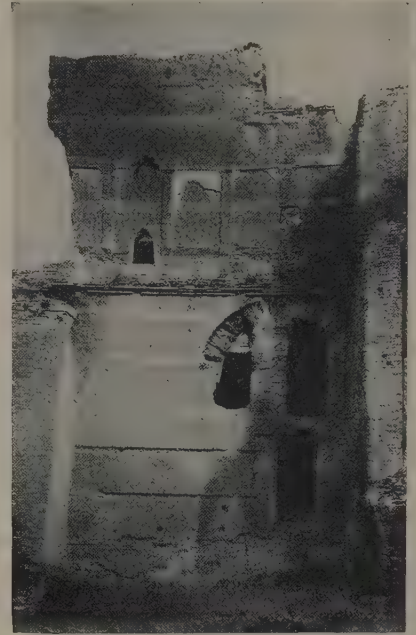


Fig. 171. Villa of Hadrian. Praetorium. Pilaster-strips

Bonvicino da Riva, in his treatise (1288) 'De magnalibus Urbis Mediolani',³ mentions among the sources of wealth in the Milanese territory: 'Silve et nemora et fluviorum margines (which even to-day are rich in timber trees) diversorum generum robora hedificiis et multis usibus apta, ligna etiam necessariis ignibus victum prebentia suficienter distribuunt.'

Before parting company with the villa of 'Sette Bassi' two other new features may be noticed. The first is the apsidal building in the group belonging to the years between 123 and about 140, known as the Stadium or Hippodrome, but

¹ M. CAFFI, *Dell' Abbazia di Chiaravalle in Lombardia*, pp. 116, 117.

² CAFFI, *op. cit.*, pp. 8-24, 47, 48.

³ *Bullettino del' Istituto Storico Italiano*, no. 20, pp. 98, 99.

obviously, with the chambers flanking the apse, a hall of basilica type. Here the western side and the apse are reinforced by massive buttresses of about 1.50 × 0.90 m. (5 ft. × 3 ft.) which enable the thickness of the walls to be reduced to no more than 70 cm. (28 in.). This is the oldest example of a buttressed apse with which I am acquainted.

The Romans used buttresses freely for apses, and engaged columns as well.¹ Occasionally they even lightened the buttresses by inserting arches in them. For instance, not to speak of a building formerly to be seen on the Via Nomentana,² there is the hall of the Sessorian Palace at Rome, known from the early sixteenth century as 'Aedes Veneris et Cupidinis'.³ Pirro Ligorio (1530-1583) (fig. 177)⁴ and Bufalini (1551)⁵ have left a misleading plan, which has been corrected by Lanciani.⁶ Remains of the apse with its buttresses and the start of the nave walls are still to be seen. The grand scale of the building (fig. 178) led Andrea Fulvio (sixteenth century) to describe it as 'Magna vestigia aedis Veneris et Cupidinis'.

The semicircular but slightly elongated apse is 17.40 m. (58 ft.) wide, and 10.50 m. (35 ft.) deep. Its interior was lighted by five large round-headed windows. The concrete half-dome is strengthened by rather irregular ribs set according to the meridians (*nervature meridiane*), consisting of a single chain of brick, and contains a few amphorae where the curve of the vault becomes pronounced. Hence it is not unreasonable to suppose that there were concentric rows of such jars. The apse wall, like those of the other parts of the hall (barely 1 m. or 3 ft. 3 in. thick), is faced with thin bricks with wide mortar joints. The hall was designed without external buttresses. Given the great size of the apse, the considerable span of its frontal arch which had to carry a wall of some height, the size and number of the windows, and also the thinness of the outer walls, the daring design of the architect must have put the apse in danger of collapsing from the moment of its settlement. As a matter of fact, at the point where the half-dome and the frontal arch meet on the north-east side (where the abutment is strongest), a large cleavage has taken place, producing sundry cracks or small fissures. This was remedied at once by two substantial square piers, each side measuring 2.25 m. (7 ft. 5 in.), set between the windows, and by two enormous raking buttresses (fig. 179) measuring 17.30 × 3.35 m. (57 × 11 ft.) and 13.60 × 3.35 m. (45 × 11 ft.) respectively, and lightened, in the one case by two large arches one above the other and a simple arch, in the other by a single arch. The brickwork of the wall between all these buttresses (which are bonded into the original structure by stone quoins) is identical with that of the apse, which, in its turn, is like that of the Basilica

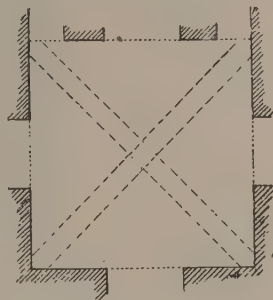


Fig. 172

Plan of room in villa called 'Sette Bassi'

¹ MONTANO, *Raccolta de tempj*, tavv. 4, 6, 19, 36. RIVOIRA, *Lombardic Architecture*, vol. 1, pp. 13, 15.

² MONTANO, op. cit., tav. 36.

³ ANDREA FULVIO, *Antiquitates Urbis*, fol. 63.

⁴ Vatican Library, *Cod. Vat. Lat. 3439*, fol. 32. Paris, Bibliothèque Nationale, *Fonds*

ital. 1129, p. 293, *Della antichità di PYRRO LEGORI Napolitano*.

⁵ EHRLE, *Roma al tempo di Giulio III. La pianta di Roma di LEONARDO BUFALINI del 1551*.

⁶ *Forma Urbis Romae*, tav. 32.

Nova in the Forum. The probable history of the building seems to me to be that it was erected in the reign of Maxentius, which is noted for daring construction and abundance of lighting, and that the abutments were added in the same period.



Fig. 173. Villa of 'Sette Bassi'. Ribbed cross-vault

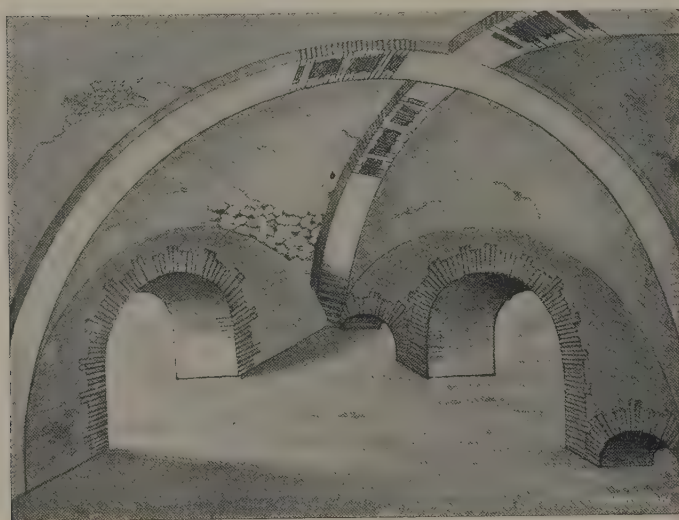


Fig. 174. Villa of 'Sette Bassi'. Ribbed cross-vault

The other new feature at Sette Bassi occurs in a cryptoporticus of the group belonging to the years 100-133, where may be seen a range of loopholes with double splays (fig. 180). These are the prototype of the double-splayed openings employed at later dates by the Campanian and Ravennate builders, and by the

Comacine gilds.¹ Montano² has illustrated several Roman buildings with double-splayed windows.

II. The square tower-like particoloured tombs with brick facing and decoration, having cupolas with pendentives.

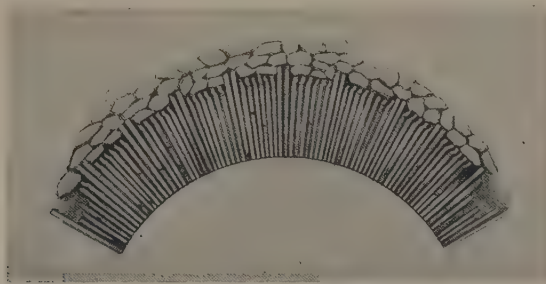


Fig. 175. Villa of 'Sette Bassi'. Construction of arch in barrel-vault

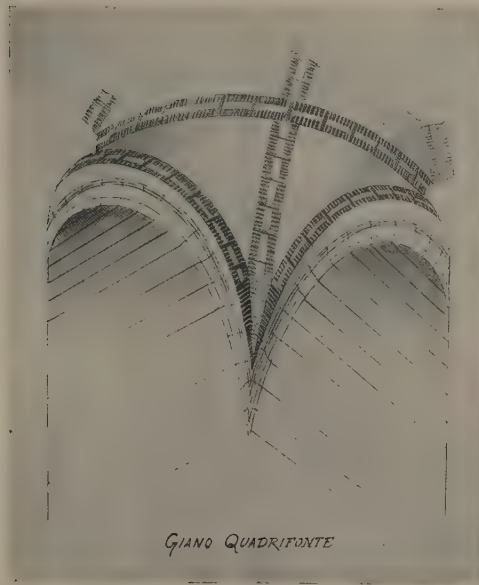


Fig. 176
Vault of the arch known as 'Janus Quadrifrons'

For the exterior visible face of such structures, bricks of red and yellow clay are used both for the facing and the ornament. The colour-scheme is applied uniformly and prominently, each colour being confined to the part which is to be contrasted with some other part. Thus, if the walls are red and the pilasters

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 93, 94.

² *Raccolta de templi*, tavv. 19, 22, 26.

which embellish or strengthen them are yellow, the two colours are used alone in either case: there is not the mixture of colours seen, for instance, in the Amphitheatrum Castrense. Also in the string courses, cornices, and panels, the same two colours are used with artistic intention and without any hybrid effect.

The facing is composed of courses of fragments of unflanged tiles, with the front edge carefully ground down and smoothed; but the inner part is thinned so as to provide the mortar with a large surface for uniting one piece of tile to another and thus make it possible to use very fine joints in the visible part, and so improve the appearance of the facing. The use of such broken material allowed the utilization of pieces rejected from the kilns and brick refuse, leading to considerable economy as compared with tiles made on purpose and used in their perfect state. As I have said, the visible facing was carefully ground down and smoothed (not first cut, as has been inferred) in order the better to resist the weather. Attention was called to the grinding process by Leon Battista Alberti (1404-1472)¹ and by Montano.²

The origin of these structures is usually derived from the 'Heroa' or small temples of the Eastern world raised on a podium; but I believe that they were direct descendants of Etruscan tombs like the structural monuments of Patroclus and Achilles in the reliefs of the well-known sarcophagus from Torre San Severo in the Museo Comunale at Orvieto;³ and though there are no actual remains of any such, still we may feel fairly sure that they existed. Of the tombs which we are discussing there are no examples before the reign of Hadrian. A specimen of his time or later is the so-called 'Sedia del Diavolo' on the Via Nomentana⁴ near the 'Coemeterium Maius' or 'Ostrianum'.⁵ Of the same age is a tomb at the fourth kilometre on the Via Nomentana, near the Casale dei Pazzi, which we shall deal with presently.

Fig. 177. Rome. Pirro Ligorio's plan of the 'Temple of Venus and Cupid' (Vatican Library, *Cod. Lat. 3439*)

After the reign of Hadrian, small structures of this type in the environs of Rome were no longer roofed with conical caps but with cross- or barrel-vaults, as may

¹ *De re aedificatoria*, ii, 10.

² *Raccolta de templi*, tav. 6.

³ *Monumenti antichi*, vol. xxiv, pp. 6-115, figs. 7, 24, 29, GALLI, *Il sarcofago etrusco di Torre San Severo*.

⁴ *Archivio della R. Società Romana di Storia*

Patria, vol. xv, p. 131, TOMASSETTI, *Della Campagna Romana nel Medio evo*. [*Papers of the British School at Rome*, vol. iii (1906), p. 45.]

⁵ PROFUMO, *La memoria di S. Pietro nella regione Salario-Nomentana* (*Römische Quartalschrift*, 21st supplement).

be seen, for instance, in the four two-storied tombs near the Basilica of Santo Stefano on the right of the Via Latina, and in those on the Via Appia Antica.

Not much later, in the reign of Antoninus Pius, will come the tomb in the Valle di Acqua Bollicante, along the Via Praenestina, the exterior side of which measures about 6 m. (19½ ft.) (fig. 181). It is of some importance from its front being ornamented with an elegant arched corbel-course, derived from those which we saw carrying balconies in the House of Caligula and the Gardens of Sallust. Later they appear in still more elaborate form in the marble-intarsia pictures of the Basilica of Junius Bassus (consul in 331) on the Esquiline (afterwards the church of Sant' Andrea cata Barbara ¹), and in those of the so-called Mausoleum



Fig. 178. Rome. ' Temple of Venus and Cupid '

of Santa Costanza,² and finally were inherited by the Lombard builders and the Comacine gilds.³

To the reign of Antoninus Pius must also belong the sepulchral edifice at the fifth milestone on the Via Appia Nuova, opposite the ruins of a villa begun under Hadrian, later enlarged and embellished with buildings erected by the brothers Quintilii (Candianus and Maximus) under Antoninus Pius and Marcus Aurelius, and finally confiscated by Commodus.⁴ Each side of the tomb measures 6.30 m. (20½ ft.) externally. Inside, each of the two stories has a cross-vault.

Closely following on this comes the most sumptuous of these monuments, the deservedly celebrated tomb of Annia Regilla 'al Triopio' in the Valle Caffarella, erected by her husband Herodes Atticus (104-180), the teacher of Marcus Aurelius

¹ HUELSEN, *Il libro di Giuliano da Sangallo*, p. 47, fol. 31.

² DE ROSSI, *Mosaici cristiani delle chiese di Roma; Mosaici del Mausoleo appellato di S. Costanza presso la Via Nomentana*, tav. iv. [WILPERT, *Die Römischen Mosaiken*, &c. (Frei-

burg im Breisgau, 1916), vol. i, pp. 276, fig. 84, and 284 f.]

³ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 36, 37.

⁴ DIO CASSIUS, lxxii, 5. NIBBY, *Dintorni di Roma*, vol. iii, pp. 724-34.

and Lucius Verus, and consul in 143¹ (fig. 182. For plan, see fig. 111). Externally each side measures about 8 m. (26 ft.), including the angle-pilasters. On two sides there are pilasters; on the third polygonal brick columns flanking the entrance to the crypt. The front has a niche between two windows above the entrance to the cella, which is reached by a flight of steps outside. The decoration

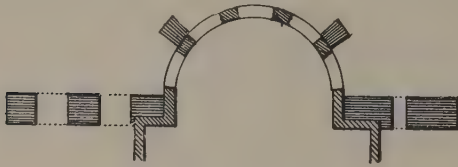


Fig. 179. 'Temple of Venus and Cupid'
Buttressing of the apse

of the front entrance, niche, windows, and upper cornice is elaborate, but at the same time florid, commonplace, and not so carefully executed as that of the tomb near the Villa of the Quintilii. After Hadrian, decorative work in brick gradually loses its elegance and becomes decadent, a stage which it reaches by the reign of Septimius Severus and Caracalla (193-217), as is illustrated by the shrine in the quarters (excavated just in that time.²

Decoration of the type of that in the tomb of Annia Regilla was also used for the top cornice of another work of Herodes Atticus, the temple supposed to be that of Ceres and Faustina, now Sant' Urbano alla Caffarella.³ The exterior brick facing is very fine, because it was meant to be seen; that of the interior, which was plastered, is careless.

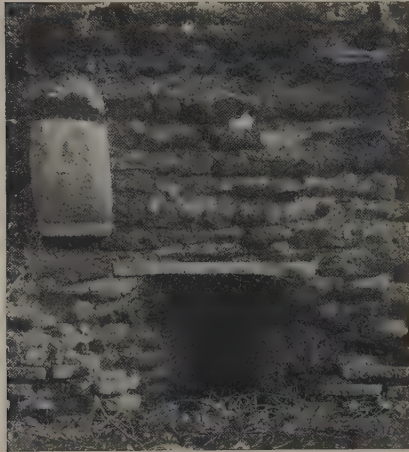


Fig. 180. Villa of 'Sette Bassi'
Double-splayed window

But the two most important of these tombs are the so-called 'Sedia del Diavolo' (figs. 183, 184) and the one near the Casale dei Pazzi.

In the first, the ground story, which is 5.20 m. (17 ft.) square, was roofed with a depressed vault starting from flat pendentives, owing to the very moderate height of the chamber, like the one we saw in the 'Domus Augustana'. The pendentives are formed of lumps of tufa set on a framework of boards; and the vault is made of the same material laid by hand.

The upper story, or principal room, had a flat cupola, the triangular pendentives of which, set between depressed arches, are formed at the base by rough brickwork developed from the sides on which they rest, and above this by a surface of lumps of tufa laid in rows by hand, just like the cupola itself. It must be remembered that I saw the two vaults in a more perfect condition than they show to-day, when they are disappearing bit by bit, and year by year. The upper one was noticed by Isabelle as one of the most authentic testimonies to the knowledge of

¹ LANCIANI, *Pagan and Christian Rome*, pp. 288-94. TOMASSETTI, *La Campagna Romana*, vol. ii, pp. 71, 72.

² LANCIANI, *Ruins and Excavations*, pp. 547-9.

³ LANCIANI, *Pagan and Christian Rome*, pp. 288-94.



Fig. 181. Tomb near the Via Praenestina, Rome



Fig. 182. Tomb of Annia Regilla : Valle Caffarella near Rome



Fig. 183. The 'Sedia del Diavolo'. Rome, Via Nomentana

domes with pendentives possessed by the Romans;¹ and Durm also called attention to it.²

In the other case, the tomb by the Casale dei Pazzi (fig. 185), the lower chamber, each side of which measures 3.70 m. (over 12 ft.) inside, has a depressed cross-vault. The upper floor, on the other hand, is covered by a spherical full-centered vault supported by triangular pendentives formed on a framework, and made, like the cupola itself, of tufa lumps laid by hand in courses (figs. 186, 187). It will be noticed that the cupola is pierced on the south side by an opening, ovoidal internally and round externally, and thus provides the oldest existing specimen (for we only possess a drawing of an earlier example in the 'Tempio di Siepe' mentioned above, p. 134) of a building of this type so lighted.



Fig. 184. 'Sedia del Diavolo' showing vault of ground floor

In the case of this dome we may remark the provision made by the architect to relieve its weight, namely, by the insertion in the side walls of niches with hood-shaped heads of large square tiles.

The horizontal section of the pendentives which we have been considering is almost flat, a sort of inclined plane from the vertical point of view; apparently on account of their small dimensions and the kind of centering used for their construction. Nevertheless, with the vaults developed from them, they constitute the prototype of that form in which the dome and the pendentives belong to different planes and curves. I am unable to say whether the process of perfecting them and their construction in courses of brick stands to the credit of the Romans or of the Eastern world. All that we know is that the former had used complete brick facing for the interiors of circular domed tombs of the Pagan Imperial period, as may be seen in a sixteenth-century drawing by an unknown artist in

¹ *Les édifices circulaires et les dômes*, p. 71, pl. xxv.

² *Handbuch der Architektur, Die Baustile, Die Baukunst der Römer*, part ii, vol. ii, p. 268.



Fig. 185. Tomb near the 'Casale dei Pazzi'
Rome, Via Nomentana

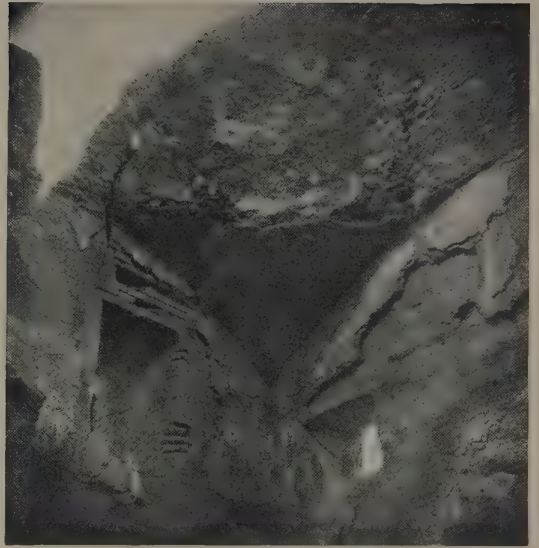


Fig. 187. Tomb near the 'Casale dei Pazzi'
Pendentive in the upper chamber



Fig. 186. Vault of upper chamber of
tomb near the 'Casale dei Pazzi'

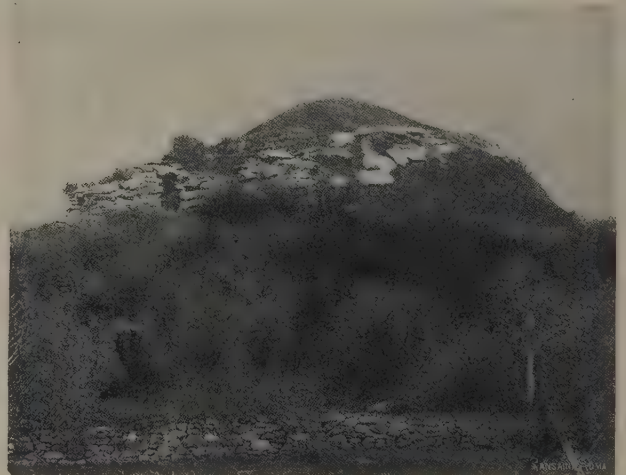


Fig. 188. Vetulonia. Tomb
'La Pietrera'

the Uffizi at Florence.¹ And it is possible that they applied triangular completely spherical pendentives of brick to the inner face of domes set above a square central space, as, for instance, that of a four-lobed tomb illustrated by Montano.² But the proof of this is wanting, and, until fresh discoveries take place, the Byzantines must have the credit of the development of pendentives into their perfect form. What is certain is that it is under Domitian (81-96) that we find the earliest



Fig. 189. Interior of 'La Pietrera'

attempts at supports of this kind—which, by an association of ideas, remind one of the figures of Atlas supporting a globe with outstretched arms and bent head—and that it is in the reign of Hadrian that we find them first applied to domes, and by Romans. They in their turn borrowed the idea from their own teachers, the Etruscans, who from the seventh century B. C. had sometimes used either angle raccords in courses projecting one beyond the other or architraves from which to start the cupolas of their underground tombs, formed of courses of stones jutting out one beyond the other, roughly shaped and set without mortar.³ These cupolas sometimes were and sometimes were not strengthened

¹ FERRI, *Indice geografico*, &c., no. 1330 v°.

² *Raccolta de tempîi*, tav. 44.

³ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 29, 30.

by a central pier or pillar, which I believe was designed by the architect to enable the round slab which closed the opening at the top to sustain more easily the great weight above it, and was not, as has been suggested,¹ solely intended as



Fig. 190. Vetulonia. Tomb 'Pozzo all' Abate'

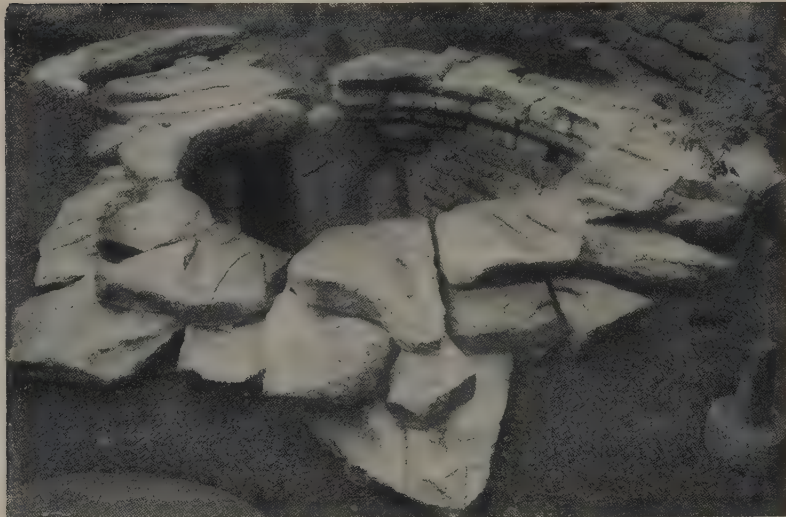


Fig. 191. Tomb 'del Diavolino' from Vetulonia (seventh century B.C.)
now in Archaeological Museum, Florence

a support, but combined the ideal and the structural function. I may refer to some Early Etruscan tombs covered by barrows, which have vaults of this kind, namely, those at Vetulonia, known as 'la Pietrera' (figs. 188, 189), 'di Pozzo all' Abate' (fig. 190), and 'del Diavolino' (fig. 191), the last, ascribed to the seventh century B.C.,² being now set up in the Garden of the Archaeological

¹ MILANI, *Studi e Materiali di Archeologia e Numismatica*, vol. ii, pp. 82, 83.

² MILANI, *Il R. Museo Archeologico di Firenze*, vol. i, pp. 282, 283.

Museum at Florence. Then there are those at Populonia, recently discovered in the neighbourhood of San Cerbone (fig. 192), and Poggio delle Granate.¹

Whether these rudimentary supports of circular vaults were invented by the Etruscans, or whether they borrowed them from other peoples, is a question which I cannot answer. Crete, for instance, furnishes an example in a tomb at



Fig. 192. Section of tomb near San Cerbone

Praesos of the Mycenaean age² (fig. 193), and in another at Kavusi.³ And in Sardinia, whose culture had relations with that of early Etruria,⁴ other examples have come to light in a rectangular chamber of the Nuraghe called Malosa or that of San Pietro near Laerru.⁵ On the other hand, they do not seem to have been employed by the Egyptians, who, however, were acquainted with rudimentary honeycomb pendentives.⁶

¹ *Notizie degli scavi*, 1914, p. 447; 1917, pp. 69 ff.

² *Annual of the British School at Athens*, viii (1901-1902), p. 240, BOSANQUET, *Excavations at Praesos*.

³ *Journal of the Archaeological Institute of America*, vol. v, pp. 132, 133, BOYD, *Excavations at Kavousi, Crete, in 1900*.

⁴ *Monumenti antichi*, vol. xxiii, col. 434, TARAMELLI, *Il Tempio nuragico*.

⁵ *Notizie degli scavi*, 1915, pp. 399, 400, TARAMELLI, *Sardinia, Laerru, Indagini nei tumuli con tombe di gigante*.

⁶ CHOISY, *L'Art de bâtir chez les Égyptiens*, p. 50.

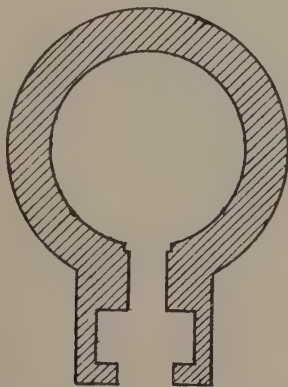


Fig. 193. Tomb at Praesos (Crete)



IX. THE ANTONINE EMPERORS

THE age of the Antonines was marked by a pause in the erection of great buildings at Rome. Antoninus Pius (138-161) executed but little new work, and what he did was prompted not by his own taste but by necessity. His main anxiety was to fill the treasury and satisfy before anything else the

wants of the people, not to speak of the measures required for alleviating the calamities from which Rome and the Empire suffered during his reign. We learn from Julius Capitolinus that, apart from the completion of the Mausoleum of Hadrian, repairs to the Coliseum and the Pons Sublicius, and the restoration of the Forum, his only works in Rome were the temple dedicated to the emperor to whom he owed his throne, and the restoration of the Graecostasis, which had been damaged by fire.¹ The temple erected in honour of the elder Faustina after her death (141) was due to a decree of the Senate.² It seems as if this niggardliness with regard to buildings in Rome extended to his palace at Lorium (Castel di Guido) on the Via Aurelia, for by the time of Julius Capitolinus, who lived at the beginning of the fourth century, only ruins of it survived.³

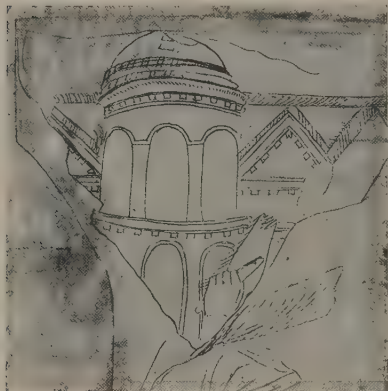


Fig. 194. Fragment of a Relief (Imperial Age). (From a drawing in the Vatican Library)

It fell to the lot of Marcus Aurelius (161-180) to make good the unfavourable consequences of a prolonged peace, seen in effeminacy of manners and relaxation of military discipline. The wars of Trajan's reign made it imperative that it should be followed by a period of peace, and this had been secured for Rome by Hadrian, whose master mind must have perceived that the nature of things required such alternations. But the excessive prolongation of the state of peace destroyed the proper balance.

In addition to these drawbacks, grave public calamities supervened: earthquakes which wrecked whole cities, floods (one of the Tiber being exceptionally

¹ *Script. Hist. Aug.*, JULIUS CAPITOLINUS, *Antoninus Pius*, 8, 2; *Verus*, 3, 1.

² *Ibid.*, *Antoninus Pius*, 6, 7.

³ *Ibid.*, *Antoninus Pius*, 1, 8.

serious), fire, famine, and pestilence. And, together with these disasters, came persecution of the Christians. The foes of the Empire, both inside and outside its frontiers, seeing it so much weakened, felt that the propitious moment had arrived for taking their revenge on Rome. And so there were invasions by the Parthians, the Germans, and other barbarians, followed later by the rebellion of Avidius Cassius, who had himself proclaimed emperor at Antioch (175); risings in the provinces, and consequently wars which dogged the footsteps of the most virtuous of emperors to his grave, and exhausted the treasury to such an extent that, in order to refill it without increasing the burden of taxation, he was obliged to sell by public auction in the Forum of Trajan the Crown jewels, the palace plate, a quantity of gems which had been discovered in a secret repository of Hadrian's, and even costly dresses belonging to the empress.¹

What wonder if in a reign which was not a bed for peaceful slumber, under a sovereign whose master passion was philosophy, and whose colleague in the government, Lucius Verus (161-169), was intent only on debauchery and extravagance, state architecture remained neglected? Hence Julius Capitolinus does not mention a single great building erected in Rome by the philosopher-emperor. Dio Cassius notices only the temple which he dedicated to Beneficence on the Capitol;² an institution barely referred to, but which sheds a bright ray of light on the charitable disposition of the founder. No trace remains of the temple erected by the Senate in honour of the emperor.³

Commodus (180-192), more than unworthy of the venerated name of the Antonines, if he was the rival in vice and cruelty of Caligula, Nero, and Domitian, did not share their taste for building. So far as construction is concerned, we only hear that in the time of Aelius Lampridius (third to fourth centuries) no work



Fig. 195. Santa Maria Capua Vetere. Tomb called 'La Conocchia'

¹ Ibid., *Marcus Antoninus*, 17. 4; 21. 9. *Incerti Auctoris Epitome de Caesaribus*, 16 (SEXT. AUR. VICTOR, ed. Teubner, p. 152). DE ROSSI, *Roma sotterranea cristiana*, vol. ii, pp. 150-1.

² DIO CASSIUS, lxxi, 34.

³ *Script. Hist. Aug.*, JULIUS CAPITOLINUS, *Marcus Antoninus*, 18. 8.

of Commodus was known except the Baths erected by Cleander in his name ; and that he did not finish works undertaken by Marcus Aurelius.¹ On the other hand, it is in his reign that history records the tremendous damage done in Rome by the great fire of the year 191.²

There is one architectural feature of note which appears under the Antonines, namely, an arcade of blank arches decorating the exterior of the drum of a dome. Thus in a Vatican MS. (Latin 3439) which once belonged to Fulvio Orsini, and contains drawings by Pirro Ligorio (1530-1583) and Panvinio (1529-1568), at folios 85 and 88 are sketches of fragments of reliefs of the time of Marcus Aurelius, representing a triumphal procession and a sacrifice against an architectural background which shows, in addition to a series of decorative pediments and arches, a round building, the drum of which is encircled by blank arcades (fig. 194).³ It was some structure of this type that suggested the design of that singular tomb popularly known as 'la Conocchia', standing on the right side of the Via Appia beyond Santa Maria Capua Vetere, and shown by its construction and decoration to belong to the end of the second or the first half of the third century⁴ (fig. 195).

Attention may also be called to another novelty, which appears outside Rome : a colonnade dividing the nave of a basilica from the apse or tribune. In the ruins of Otricoli are the remains of a civil basilica, the apse of which, flanked by chambers, is separated from the nave by two columns. The basilica, Guattani's⁵ plan of which will be found in fig. 118, belongs to the time of Antoninus Pius and the elder Faustina, busts of whom have been discovered in the place.

¹ *Script. Hist. Aug.*, AELIUS LAMPRIDIUS, *Commodus Antoninus*, 17. 5.

² DIO CASSIUS, lxxii, 24. MIGNE, *Patr. gr.*, vol. xix, col. 565, HIERONYMUS, *Eusebii Chronica*. [FOTHERINGHAM, *op. cit.*, p. 291.]

³ *Papers of the British School at Rome*, vol. iv (1907), pp. 229-57, pls. xxi-xxiii, WACE,

Studies in Roman Historical Reliefs. RIVOIRA, *Lombardic Architecture*, vol. i, p. 23 ; *Moslem Architecture*, pp. 221, 228.

⁴ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 251, 252.

⁵ GUATTANI, *Monumenti antichi inediti*, 1784, pp. xxvii-xxxiv, tav. i.



X. SEPTIMIUS SEVERUS AND CARACALLA

THE reigns of Septimius Severus (193-211) and Caracalla (211-217) were marked by unusual activity in public building, made necessary to a large extent by the great fire under Commodus, and on a scale which justified the title of 'Restorers of Rome' conferred by the Senate on the two emperors.



Fig. 196. Palatine. Remains of Palace of Severus (left) and Septizonium (right) as they were in the sixteenth century

(From DU PERAC, *Vestigi*, pl. 13)

We will confine ourselves to the most important brick structures erected by them, viz. the Palace on the Palatine, and the *Thermae Antoninianae* or Baths of Caracalla.

THE PALACE OF SEPTIMIUS SEVERUS on the Palatine was erected by that emperor, together with the Septizonium (fig. 196), which formed a sort of façade to it, and was designed, by its imposing size and sumptuous decoration, to impress

his Tripolitan fellow countrymen as they entered Rome from the Via Appia.¹ The points to be noticed are :

(1) In the cross-vaults of the arched substructures of the palace the use of stout diagonal ribs consisting of three parallel chains formed of brick voussoirs set edgeways, those of the middle line having their edges chipped off with the hammer, connected in pairs at intervals with large tiles bonded into the concrete. This is the first time that we meet with a systematic use in groining, in the form of three chains, of the principle of strengthening cross-vaults, which had its beginning under Hadrian in the villa of Sette Bassi.

(2) In a room (noticed by Choisy²) belonging to a structure which projects towards the Circus Maximus and is supposed to have been the Imperial box ('pulvinar'), each diagonal arch of the cross-vault is formed of a rough line of bricks set edgeways, with large tiles dressed with the hammer set at intervals in

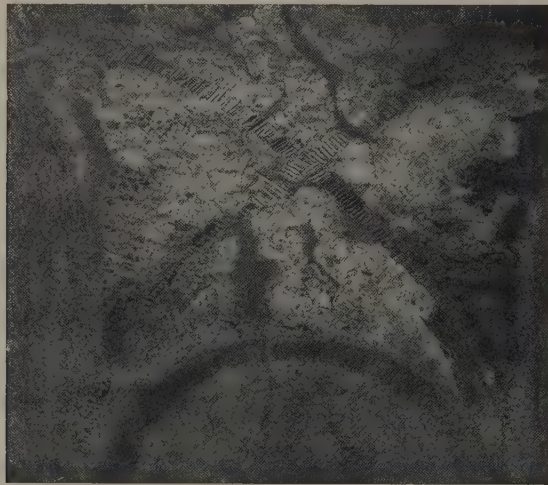


Fig. 197. Palatine. Palace of Septimius Severus.
Vault in the Pulvinar

order to bond the line of bricks into the concrete mass (fig. 197). This is the earliest example of such a practice. But it is not contemporary with the erection of the palace, and belongs to a later date. The brickwork of the building of which it forms part, with its thin, roughly formed bricks and wide joints, is certainly not of the time of Septimius or even of Alexander Severus, when thin bricks were to some extent mixed with thicker ones, and the breadth of the mortar joints was not yet excessive. It belongs to the period when only thin bricks were used, set in wide irregular beds of mortar ; and that begins under the Gordians.

(3) In some of the barrel-vaults of these substructures jars are found set in the haunches, providing the earliest example inside the city of this method of lightening vaulting. Outside Rome, the builder of a tower-like particoloured tomb of the Antonine age, standing beyond the fourth milestone of the Via Appia Antica on the left hand, had used them at the impost of the cross-vault of the

¹ *Script. Hist. Aug.*, SPARTIANUS, *Severus*, 19. 5 ; 24. 3.

² *L'art de bâtir chez les Romains*, p. 79, pl. vii.

upper chamber. This sporadic example, while it does not imply a settled theory or calculations of equilibrium, shows an intuitive perception of them: the jars are not placed haphazard, but with a definite purpose in view.

I may observe that such vessels would be waste or rejected pieces of no value, and therefore useful as economizing material. Previously, it seems, the Romans



Fig. 198. Palatine. Substructures of the Palace of Severus, showing corbels

had only used earthenware pots in walls to lighten great masses of masonry, as at Aosta in the time of Augustus.¹ The employment of pottery vessels to lighten the haunches of vaults was a discovery of the Campanians. The Stabian Baths at Pompeii (second to first century B. C.) provide an early example.

(4) In these same substructures may be noticed the corbels inserted at the top of the piers, on which to fix the centering (fig. 198).

(5) The upper floor of the Exedra (built under Severus, and thought by some to be an 'oecus' or 'triclinium') in the so-called Hippódrome or Stadium of

¹ C. PROMIS, *Le antichità di Aosta*, p. 141.



Fig. 199. Rome. Arch of the Caelian
Aqueduct



Fig. 200. Rome. Thermae of Caracalla

Domitian, has a concentric service-passage running behind it, suggestive of the later ambulatory round the apses of some Christian basilicas. Before this, though with a different purpose, the niches of Nero's Nymphaeum on the Caelian had annular barrel-vaulted passages behind them.

Before leaving the palace of Severus I may remark that, in the colossal new Caelian aqueduct (201) built to bring the Aqua Claudia to it,¹ may be seen, near

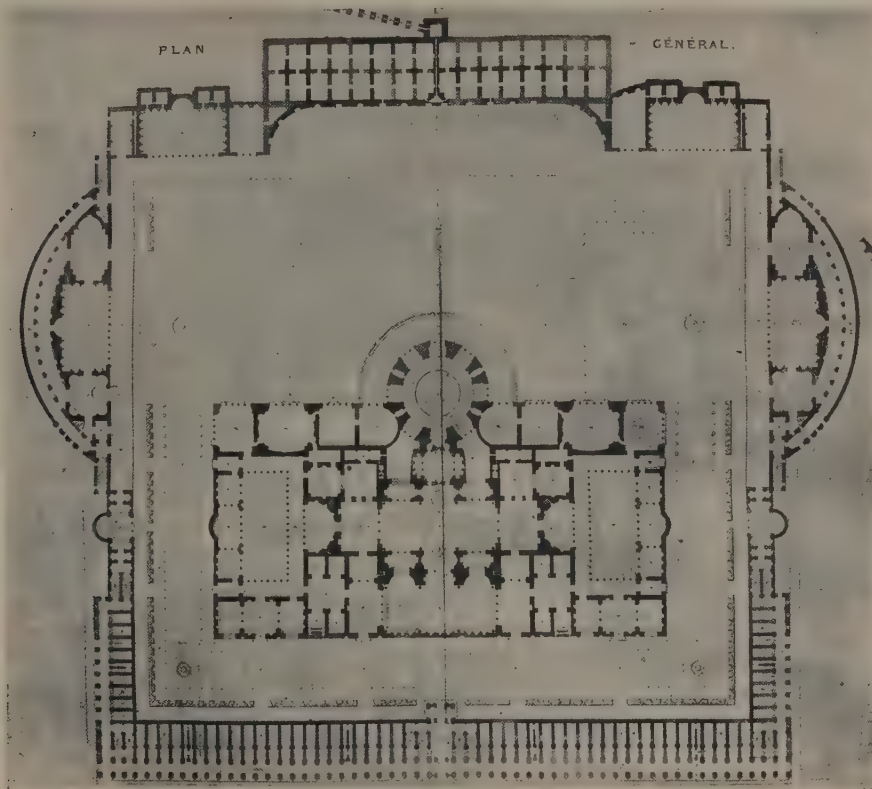


Fig. 201. Plan of the Thermae of Caracalla
(From BLOUET, Pl. III)

the arch of Dolabella and Silanus, arches which are stilted more than a metre (3 ft. 3 in.) above the impost-cornice (fig. 199). This form, of Roman origin, not Byzantine as is generally thought, had appeared earlier in the front colonnade of the peristyle of the House of Fortune at Pompeii, where the semicircular arches resting directly on the capitals are somewhat stilted (fig. 114).

THE THERMAE OF CARACALLA were begun between 212 and 213, together with the branch of the Aqua Marcia Antoniniana which supplied them, and were opened to the public in 216. They were finished by Heliogabalus and Alexander Severus.²

¹ NIBBY, *Roma Antica*, vol. i, pp. 348, 349.

² *Script. Hist. Aug.*, SPARTIANUS, *Antoninus*

Caracallus, 9, 4; LAMPRIDIUS, *Antoninus Heliogabalus*, 17, 9; *Alexander Severus*, 25, 6. C.I.L.,

Distinguished for their splendour and elegance, they were regarded by Serlio (1475-1552) as 'the best designed' of all the Roman *Thermae* on account of their 'more elaborate fittings, and the symmetry of all the parts' ¹ (figs. 200, 201).

[We know nothing about the situation or actual form of their 'cella soliaris', the hall for the 'solium' or great bath, which was regarded by the architects of the time of Constantine as a miracle of engineering skill. 'Thermas . . . quarum cellam solearem architecti negant posse ulla imitatione, qua facta est, fieri, nam et ex aere vel cupro cancelli subterpositi esse dicuntur, quibus concameratio tota



Fig. 202. *Thermae* of Caracalla. Octagonal hall in the eastern exedra, showing window in the drum and triangular pendentive

concredita est, et tantum est spatii, ut id ipsum fieri negent potuisse docti mechanis.' ² But it is a plausible suggestion that it was the frigidarium, ³ and that the ceiling was supported by iron T-shaped crooks, hung from a framework of bronze or copper girders. ⁴ A device of this kind was suggested by the one described by Vitruvius ⁵ (see p. 29).

vi, 1246. MIGNE, *Patr. lat.*, vol. xxvii, col. 480, HIERONYMUS, *Eusebii Chronica*. [FOTHERINGHAM, op. cit., p. 295.]

¹ G. D. SCAMOZZI, *Tutte l'Opere d'Architettura di Sebastiano Serlio* (Venice, 1584), fol. 91.

² *Script. Hist. Aug.*, SPARTIANUS, *Antoninus Caracallus*, 9. 4.

³ [But see BOUSSOIS in *Mélanges*, xxix (1909), p. 401, and Dr. ASHBY in the *Architectural Review*, xlv (1919), pp. 79-81 (reprinted in *Architectural Watercolours and Etchings of W. Walcot*, p. 36), supporting the view that it is the calidarium.]

⁴ LANCIANI, *Ruins and Excavations*, p. 537.

⁵ v, 10, 3.

From the actual remains of the *Thermae*, and from drawings which have come down to us, we derive the following information.

(1) The statical coherence of the building depends on the ingenious grouping of the various parts of the whole block, helping to counteract the thrusts of the vaulting. But in the great central hall (the so-called *tepidarium*), the three lofty cross-vaults above the central space, which overtops the rest of the building except the *calidarium*, rest on wall and angle columns surmounted by corniced entab-

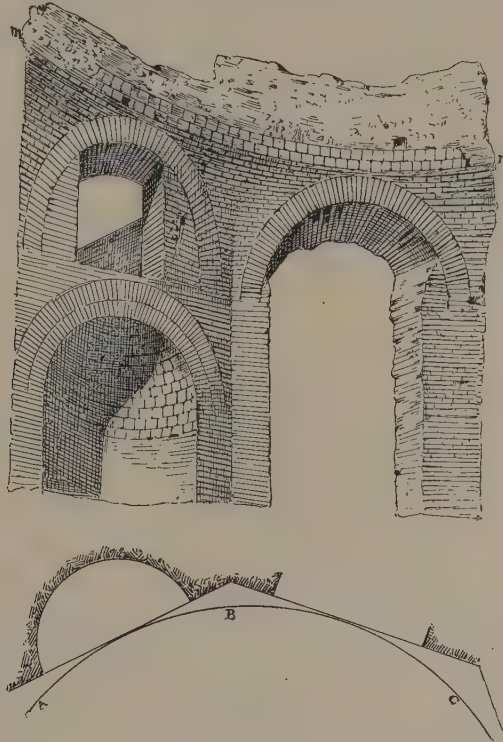


Fig. 203. *Thermae* of Caracalla. Sketch and plan of octagonal hall. (The line ABC shows the projection of the dome between the points *m* and *n*)

latures, and were safeguarded from disturbing and dislocating movements of the haunches during the period of settlement by raising above them the walls of the six lateral recesses of the *tepidarium*, which thus provided so many rectangular buttresses, each being pierced by a communicating arch.

(2) Half-domed recesses in walls below windows. In the two halls, of octagonal shape internally, forming part of the two great *exedras* in the 'xystus' or garden (the one on the eastern side has angle niches at the base of the dome), are to be seen windows set in what may be described as the drum or cylindrical wall of the dome (figs. 202, 203). This is the oldest existing example of an invention of the Hadrianic age which may be seen in the drawing reproduced in fig. 151.

So far as one can tell from the remains of the calidarium,¹ its imposing dome, 35 m. (116 ft.) in diameter, also had large windows opening below its impost, as was noticed by Palladio² and Blouet,³ and not with their heads rising into



Fig. 204. Thermae of Caracalla. Calidarium.
Pier and pendentive



Fig. 205. Qasr al Nuwayjis. Roman tomb
(From a photograph belonging to the 'Palestine Exploration Fund')

the dome itself, as represented by Iwanoff.⁴ The dome was erected upon eight curvilinear piers united by two tiers of arches. Of special interest is the drum

¹ [The calidarium referred to is the circular hall projecting from the south-west front of the central block, fig. 201.]

² BERTOTTI, SCAMOZZI, *Le Terme dei Romani*, tav. x.

³ BLOUET, *Restauration des Thermes d'Antonin Caracalla à Rome* (Paris, 1828), p. 18, pl. viii.

⁴ IWANOFF, HUELSEN, *Architektonische Studien*, III, *Aus den Thermen des Caracalla* (Berlin, 1898), pp. 38-41, taf. xvi, xvii.

with its brick facing, a material which has a certain elasticity in view of movements of the vault. The two-ringed arches at the top of the great windows were built on a straight line, for statical reasons ; and this line formed a contrast to the pro-

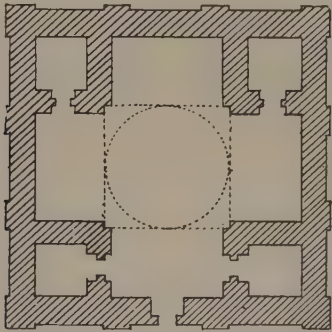


Fig. 206. Plan of Roman tomb at Qasr al Nuwayjis

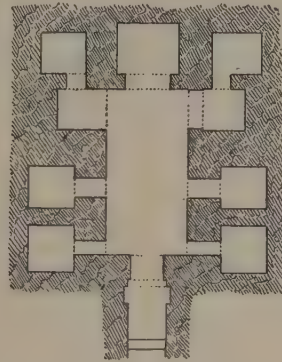


Fig. 207. Vulci. François tomb

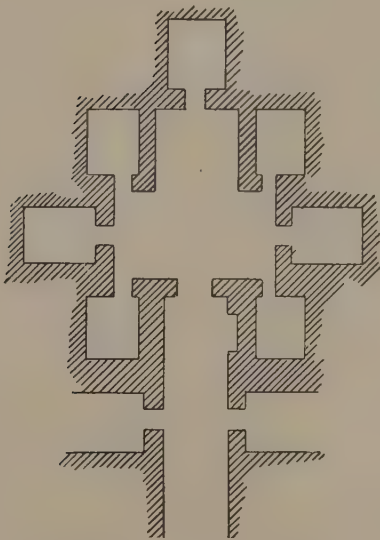


Fig. 208. Perugia. Tomb of the Volumnii.

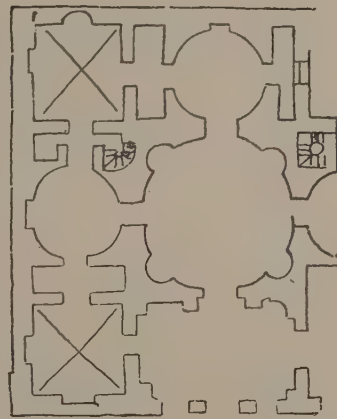


Fig. 209. Plan of part of a Roman building
From a drawing by Fra Giocondo in
the Uffizi, Florence (no. 3932)

jection of the pendentives developed from the piers in order to carry the dome. Hence, below the impost of the latter, concave raccords or connecting pieces were formed, mistaken by some for lunettes, in order to unite the alternately straight and curved surfaces (fig. 204).

Amphorae were also used in a tentative way in the dome of the calidarium. The cavities left where two of them have been can still be seen about two metres

(6 ft. 6 in.) from the impost line. This is the earliest spherical vault lightened in this way that I know of.

Hadrian was the first to exhibit the device, Latin in origin,¹ of windows inserted below the base of a dome, when he carried a row of blank windows round the basal zone of the dome of the Pantheon. But it is not till the time of Caracalla that we find domes lighted by windows in the drum. Illustrations of Roman buildings lighted in a similar way are given by Serlio² and Montano;³ but we do not know their precise dates.

On the exterior of the cylindrical wall of the dome of the calidarium are two large curvilinear recesses designed to unite it to the adjacent rooms. Such recesses were the origin of the large niches pierced with windows in buildings of the age of Constantine, such as those still to be seen in the Mausoleum of St. Helena (fig. 278).

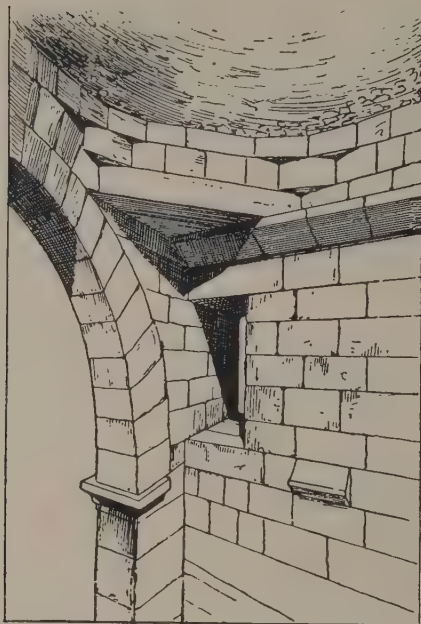


Fig. 210. Umm ez Zeitun. Chapel
Raccord at base of the cupola

(3) Domes resting on triangular pendentives, where both dome and pendentive form part of one and the same spherical surface. In the two halls of the exedras in the garden, mentioned above, the internal octagon passes into the circle of the dome by means of pendentives of this species, but of a type which is still immature, for, instead of being geometrically spherical triangles they become spherical only in their upper half, while the lower half forms a re-entrant angle where the lines of the side-walls on which they rest are continued.

In Italy it was at Ravenna that these pendentives were brought to their perfect form and constructed in brick, and instructive examples may be seen there in the Mausoleum of Galla Placidia (about 440) and the Baptistry of Neon (449 or 458-477) (figs. 314, 316). In the East the earliest specimen of this type of support to be seen is the one in hewn stone of what is believed to be a Roman mausoleum at Qasr al Nuwayjis in Eastern Palestine, assigned to the second century⁴ (figs. 205, 206). This is a square building, each side measuring about 13 m. (over 42 ft.) externally, with its central bay covered by a dome resting on pendentives which merge into it, and buttressed by four barrel-vaults.

A plan of this type was used by the Etruscans in their sepulchral crypts: for instance the François tomb at Vulci (fourth to third century B. C.) (fig. 207),⁵ the

¹ RIVOIRA, *Moslem Architecture*, pp. 121, 122.

² SCAMOZZI, *Tutte l'opere d'Architettura di Sebastiano Serlio* (Venice, 1584), fol. 63.

³ MONTANO, *Scielta de varii tempietti*, tavv. 3, 29, 30, 34, 38, 42, 43, 45, 49; *Raccolta de tempii*, tavv. 3, 4, 5, 7, 13, 15, 20, 23, 27, 35, 37, 38,

40, 43, 46, 48.

⁴ *Survey of Eastern Palestine* (1889), pp. 172-4, Kusr en Nûejjis.

⁵ DES VERGERS, *L'Étrurie et les Étrusques*, vol. iii, pl. xxx.

tomb of the Volumnii near Perugia (fourth century B.C.)¹ (fig. 208), and that known as the Tomb of the Seats and Shields (Grotta delle Sedie e Scudi) at Cervetri.² Later, the Romans introduced various treatments of the vaults, as may be seen in a building, the plan of which has been preserved in a drawing by Fra Giocondo (3932) now in the Uffizi at Florence. Here we find a central cupola surrounded by three smaller ones, four cross-vaults, and a barrel-vault (fig. 209).

The Byzantine type of church with a quadrangular outline and central dome was based upon plans of this sort derived from the tepidarium of the great Roman *Thermae* and the Basilica of Constantine, with suggestions drawn from Roman tomb-buildings, the plans of so many of which have come down to us.³

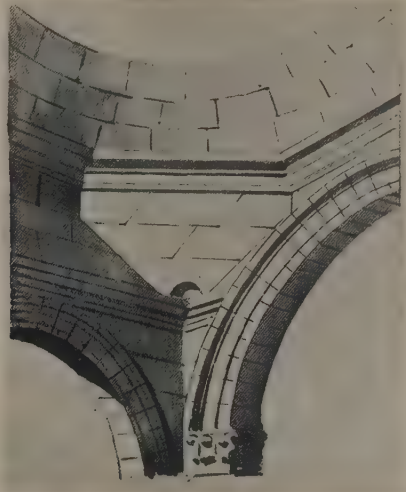


Fig. 211. Lattaqiyyah (Syria). Angle of the Roman arch

I must pause for a moment to consider the pendentives of the tomb at Qasr al Nuwayjis, the date of which has been assigned to the later Roman Empire, but unsupported by valid arguments or parallels.

There is no evidence that this new type of dome-support was used in Syria and Palestine at the end of the third century. In the chapel of Umm ez Zeitun, finished in 282⁴ (fig. 210), the architect resorted to a polygonal outline overhanging the square base of the dome, which is multiplied stage by stage till it merges in the circle of the cupola. And in the four-faced arch at Lattaqiyyah (Laodicea), ascribed to the third century, the square passes into the circle by means of four small angle niches which support as many pieces of wall, thus doubling the number of sides below⁵ (fig. 211).

The specimen, again, of a pendentive in squared stone in a building at Gerasa

¹ CONESTABILE, *Il sepolcro dei Volumni*, tav. i.

² DENNIS, *Cities and Cemeteries of Etruria*, vol. i, pp. 255-7.

³ RIVOIRA, *Moslem Architecture*, p. 188.

⁴ DE VOGÜÉ, *Syrie Centrale*, vol. i, pp. 41-5. RIVOIRA, *Lombardic Architecture*, vol. i, p. 35; *Moslem Architecture*, p. 183.

⁵ DE VOGÜÉ, *Syrie Centrale*, vol. i, pp. 75, 76. RIVOIRA, *Lombardic Architecture*, vol. i, p. 193.

(Syria) dated by Choisy under the earlier Empire,¹ has every appearance, when the actual buildings are compared on the spot, of being contemporary with the so-called Double Gate and Golden Gate of Jerusalem, that is to say of belonging to the time of Justinian (fig. 212). Nor has it been established that the form occurred in Asia Minor in the Roman period. Choisy's dating of examples at Philadelphia, Magnesia, and Sardis is too vague.²

Before leaving the subject of these pendentives, I may call attention to those in a Roman tomb of the Imperial age illustrated by Montano.³

(4) The systematic use in the larger vaults of pieces of black pumice stone in the parts of the filling-in (laid on tiles) which overhang most, and also of those



Fig. 212. Jerusalem. The Golden Gate

which rest on columns, in order to relieve the latter from any excessive weight. This may still be verified in the remains of the webs of the great cross-vaults of the tepidarium, and also the barrel-vaults supported by columns, and in the great exedras of the two palaestras⁴ which are without meridian ribs (*costoloni meridiani*) (fig. 213). When, at a later date, such methods of strengthening were resorted to, the systematic use of volcanic scoriae in circular vaults went on just the same, as may be seen in the Licinian Rotunda ('Minerva Medica') and the Baths of Diocletian.

¹ CHOISY, *L'art de bâtir chez les Byzantins*, pp. 88-90, pl. xv. RIVOIRA, *Lombardic Architecture*, vol. i, p. 34.

² RIVOIRA, *ibid.*, pp. 29-35. CHOISY, *op. cit.*,

pp. 90-7.

³ *Raccolta de tempîi*, tav. 19.

⁴ [The palaestras are the two large oblong courts at the ends of the central block, fig. 201.]

Pumice stone is not only very light but has the advantage of giving an excellent hold for mortar, and when the latter is mixed with pozzolana (which is volcanic matter,¹ and ought not to be described as sand or gravel²) of forming a solid mass of very durable nature.

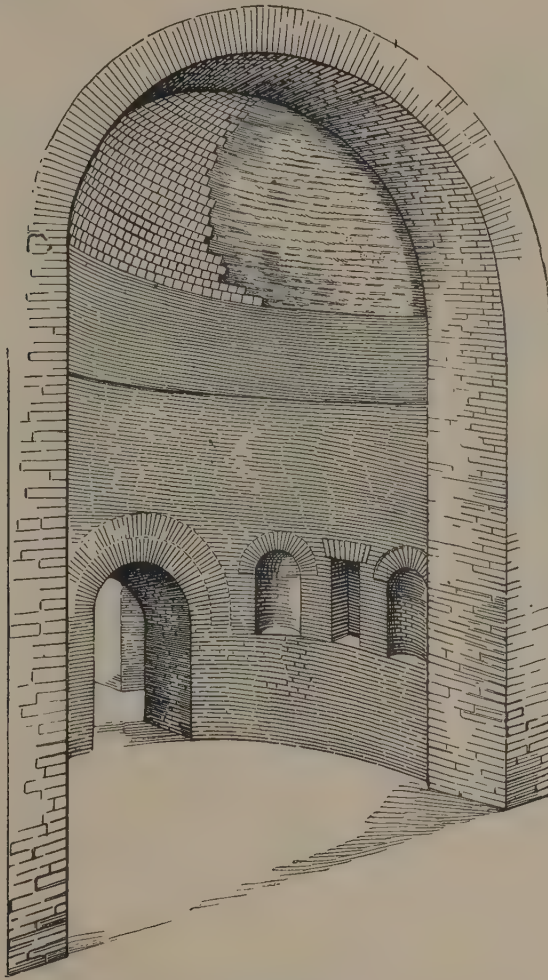


Fig. 213. Baths of Caracalla. Exedra of the eastern palaestra

(5) The absence of ribs on the meridian lines (*nervature meridiane*) in all the domes and half-domes. Such members make their first appearance under Alexander Severus (222–235) in the calidarium of the Thermae of Agrippa, important remains of which are to be seen in the Via dell' Arco della Ciambella (fig. 142). Here the bricks, which are still thick like those of the age of Septimius Severus and Caracalla, certainly do not belong to Hadrian's rebuilding, but on the contrary betray the

¹ VERRI, *Carta geologica di Roma*.

² *Journal of Roman Studies*, vol. iii (1913), pp. 197–203.

fact that they are contemporary with the brickwork of Alexander's aqueduct built to supply the Baths which he erected (227) to replace those of Nero.¹

Their origin may be traced back to the radiating roofs of certain Etruscan tomb chambers excavated in the natural rock. These are semi-domes (described as umbrella or lamp-shade or fan-shaped) in which, starting from a disk surrounded

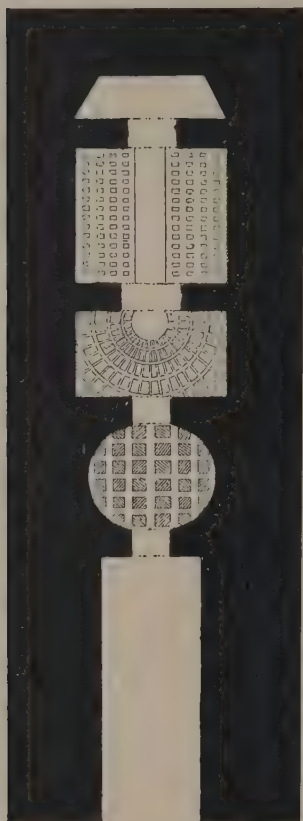


Fig. 214. Cervetri. Tomb with circular vestibule. (From CANINA, *Etruria maritima*, i, tav. lxxi)



Fig. 215. Thermae of Caracalla
(From a drawing by Dosio in the Uffizi)

by rays, meridian ribs intersected by horizontal ones form a sort of lattice which recalls the central opening, the disk to close it, the meridian ribs, and the parallel courses of large tiles in Roman ribbed domes. Interesting examples of roofs of this kind may be seen at Cervetri in the tombs described by Canina as the one with architectural ornament and the one with a circular vestibule (fig. 214).² Also at Vulci in the 'tomb of the sun and the moon'.³

¹ *Script. Hist. Aug.*, LAMPRIDIUS, *Alexander Severus*, 25, 3. MIGNE, *Patr. lat.*, vol. xxvii, col. 482, HIERONYMUS, *Eusebii Chronica*. [FOTHERINGHAM, op. cit., p. 297.]

² CANINA, *L'antica Etruria marittima*, vol. i, pp. 196, 197, tavv. lxxviii, lxxi.

³ DENNIS, *Cities and Cemeteries of Etruria*, vol. i, p. 448.

(6) The embellishment of interiors by ranges of columns carrying architraves, one above another. This was used for the first time in the frigidarium, as may be seen from sketches by Dosio (1533-1609),¹ and Giambattista da Sangallo called 'il Gobbo' (the hunchback) (1496-c. 1546)² (figs. 215, 216).

(7) The interesting system of ventilation, which, I fancy, has not been noticed before, and would deserve a special study.

¹ FERRI, *Indice dei disegni di architettura esistenti nella R. Galleria degli Uffizi in Firenze*,

no. 2563, p. 202.

² FERRI, *op. cit.*, no. 1656, p. 202.



Fig. 216

Thermae of Caracalla. Sketch of part
of the elevation of a hall

(From a drawing by G. B. Sangallo in the Uffizi)



XI. THE GORDIAN EMPERORS

IN the short reign of the three Gordians (238-244) various characteristics displayed in the remains of their villa call for some notice. A short description of it is preserved by Julius Capitolinus.¹ Of these remains, which have been described by Nibby,² we will select two, situated at the third milestone on the Via Praenestina, on the left side.

(1) An octagonal bath-room with niches alternately round and rectangular, which in medieval times had a superstructure erected above its dome propped up by a central pier, and was made into a watch-tower (fig. 217). Here the octagon passed into the circle at the base of the dome by means of rudimentary pendentives at the angles, exactly like those which we noticed in the Baths of Caracalla.

In the next place the dome, which was provided with meridian ribs up to about the half of its curve, was lightened in the remaining part by inverted amphorae arranged in concentric rings (fig. 218). This is the earliest example of a dome so treated that I am acquainted with, coming after the rudimentary specimen in the calidarium of the Baths of Caracalla (p. 171).³ The tentative use of hollow vessels, appearing under the Antonines and Septimius Severus, is here developed and systematized, and reveals a clear constructive and static intention, namely that of lessening the thrust of the vault where the curve is most pronounced, and reducing the weight by distributing it in proportion to the relatively very moderate thickness of the supporting walls, which is only 1.30 m. (4 $\frac{1}{4}$ ft.). That this was the case is testified to by the contemporary mausoleum close by, where the dome is solid at the top, the drum having a thickness of quite 2.80 m. (9 $\frac{1}{4}$ ft.).

Accordingly, Choisy's assertion that the idea of using pottery vessels to reduce the pressure and weight of vaults was foreign to the Romans⁴ will not stand the test of facts. So little was it foreign to them that, when the architects of Ravenna were starting to construct, for the first time, domes and half-domes with terra-

¹ *Script. Hist. Aug.*, CAPITOLINUS, *Gordiani* tres, 32, 1-3.

² *Dintorni di Roma*, vol. iii, pp. 707-12.

³ RIVOIRA, *Lombardic Architecture*, vol. i, p. 20.

⁴ *L'art de bâtir chez les Romains*, pp. 96-8.

cotta tubes of syringe form, they derived the first suggestion from Roman buildings (see p. 261).

(2) The circular mausoleum of the Gordians, known as 'Torre de' Schiavi' (fig. 219).¹ The wall surface is exactly like that of the bath-room just described,



Fig. 217. Remains of an octagonal hall in the Villa of the Gordians near Rome

with thin rough bricks and thick mortar joints. The basement or lower story is remarkable for its circular barrel-vault, with lunettes over the two entrances which are opposite to one another, and the niches formed in the outer wall, which is 3.30 m. (nearly 11 ft.) thick. The vault springs from a low round pier in the middle, 3.30 m. in diameter (fig. 220).

¹ [The brick stamps, however, show that it is not earlier than Diocletian. ASHBY, *Papers of the British School at Rome*, vol. i (1902), p. 159.

LUGLI, *Bull. Comunale*, xliii (1915), pp. 130 ff. *C. I. L.*, xv, 1627, 9; 1628, 8.]

This structure inspired the architect of the Mausoleum of Romulus (307-309), son of Maxentius, the imposing ruins of which, surrounded by arched cloisters, stand beside the Circus which he erected on the Via Appia Antica.¹ All these buildings are contemporary and belong to the age of Maxentius, being dedicated

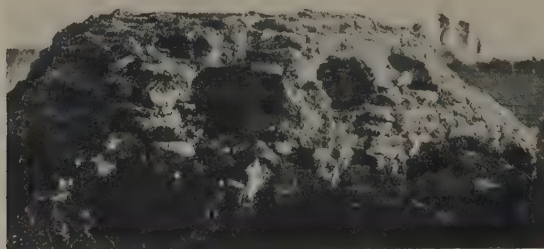


Fig. 218. Fallen fragment of the vault of octagonal hall in the Villa of the Gordians. The dark cavities are the remains of the amphorae

in honour of his son Romulus.² The architect, however, improved the central pier by inserting niches in it, as may be seen in one of Montano's illustrations,³ or by actual inspection. He took the idea from the treatment of the central block in the upper chamber of the tomb of the Plautii on the Via Tiburtina (fig. 14).

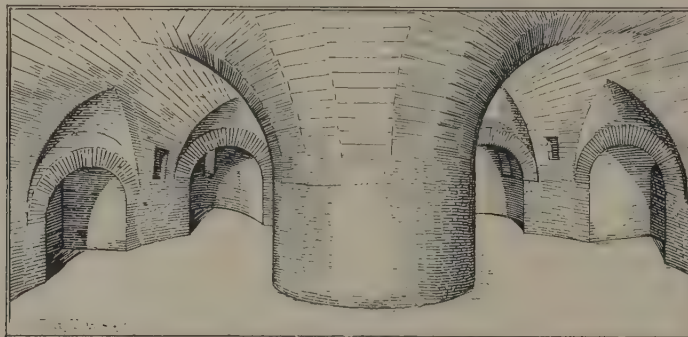


Fig. 219. Basement of 'Tor de' Schiavi'

These circular vaults recall the interesting one with transverse arches in the Nymphaeum, incorrectly called the Temple of the Sun, belonging to the 'Horti Aciliorum' at Rome.⁴ The idea came from the characteristic curvilinear roofs of Etruscan tombs at Volterra,⁵ for instance that of the so-called 'Grotta de' Marmini', cut in the rock not later than the third century B.C., where the solid

¹ CANINA, *Edifici*, vol. v, p. 26; vi, tav. xvii.

² NIBBY, *Roma antica*, vol. i, pp. 632-44.

³ *Raccolta de' templi*, tav. 29.

⁴ LANCIANI, *Forma Urbis Romae*, tav. ix;

Ruins and Excavations, p. 426.

⁵ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 283, 284.

central pier is ornamented with two projecting heads ('protomi'), one of which seems to be a Lasa or goddess. Another example is in one of the Inghirami tombs (dated from the middle of the fourth to the middle of the third century B.C.)¹ also excavated in the rock, where the square pier is continuous with the floor and the segmental depressed curve of the vault of the chamber.

¹ MILANI, *Museo Arch. di Firenze*, vol. i, p. 285.



Fig. 220. Mausoleum in the Villa of the Gordians, known as
'Tor de' Schiavi'



XII. THE LICINIAN EMPERORS

VALERIAN AND GALLIENUS

THE reign of the two emperors of the Licinian family, Valerian and Gallienus (253–268), was marked by a notable advance in the art of dome-construction, including the employment of important new elements. This progress is—and it is a remarkable fact—in an inverse ratio to the technique of building, where we find, on the contrary, a marked decadence resulting from the thinness of the bricks and the thickness of the mortar joints, a decadence which becomes evident as early as the time of the Gordians. We may see that such is the case by an examination of four buildings: the rotunda of the Licinian Gardens, the mausoleum of Gallienus, the tomb of the Calventii, and the so-called temple of Portumnus.

THE ROTUNDA or hall, popularly known as the temple of Minerva Medica, is thought to be a nymphaeum, or else a hall belonging to baths (figs. 221, 222). At the beginning of the sixteenth century it was still to a great extent intact, as it is shown in an engraving of 1503 (fig. 223).¹ Some think that it was included in the 'Horti Liciniani' or 'Palatium Licinianum',² while others feel doubts about this identification, and consider it very questionable.³ But the fact remains that in its vicinity numerous traces have been found of important structures of the second half of the third century, designed for entertainment, baths, and games, pointing to the existence of a villa which, considering the magnificence and the size of the building with which we are concerned, must have belonged to the emperor, and has every appearance of being that of the Licinii.⁴

When complete its plan was as follows (fig. 224). The ground floor was a decagon of about 24 m. (80 ft.) between the opposite sides, with curvilinear recesses projecting outwards, four of them being pierced with openings. Later there were added a vestibule in front, and two exedras on the transverse axis, where the poor facings of alternate courses of bricks and roughly squared tufa blocks are

¹ From Dr. Ashby's collection. [Passavant, *Le Peintre-Graveur*, v, 151, 9. HIND, *History of Engraving and Etching* (London, 1923), p. 485.]

² LANCIANI, *Ruins and Excavations*, pp. 402–6. NIBBY, *Roma Antica*, vol. ii, pp. 328–36.

³ JORDAN, HUELSEN, *Topographie der Stadt*

Rom, vol. i³, pp. 358–62.

⁴ *Annali della Società degli Ingegneri e degli Architetti Italiani* (1904), GIOVANNONI, *La Sala termale della villa Liciniana e le cupole romane*, pp. 165–201. [The *Legacy of Rome*, p. 455.]



Fig. 221. Rome. Nymphaeum of the Licinian Gardens (Minerva Medica)
South side



Fig. 222. Nymphaeum of the Licinian Gardens
North side

nearly related to those of the Circus of Maxentius on the Via Appia Antica (fig. 227). The upper stage is a rectilinear decagon with large windows in the sides.

The recesses, owing to the great weight of the lofty walls and the dome which rose above them, were provided in every case with meridian ribs, and the frontal arch had a double ring of bricks, with large tiles inserted at intervals.



Fig. 223. Nymphaeum of the Licinian Gardens
(From an engraving of 1503 in Dr. Ashby's Collection)

The drum was strengthened at the salient angles by substantial buttresses set on lines radiating from the centre, in order to increase the stability at the external points where the thrust of the vault would be most felt. We do not know what form they had in the lower stage, as they are hidden in the structures which have been built against it ; but it must have been like those of the tomb of the Calventii which we shall see presently.

The transition from the polygonal drum to the dome was effected by moulding up the wall material, a method recalling that followed in the case of the domes over the two octagonal rooms in the 'Domus Augustana'.

The dome is apparently spherical inside, but as a matter of fact is slightly undulated, and outside is stepped, a form which the Romans must have derived from the stepped cones of Etruscan tombs such as the one at Bieda noticed by Dennis.¹ It is strengthened by meridian ribs following the curve of the dome, set on the solid wall-spaces between the windows, and meeting at the top in a keystone² (fig. 225). The secondary ribs of different form, to be seen in the intermediate sections of the vault, are not to be regarded as the result of a decline in Roman methods;³ but are rather due to the hesitation which attends a first attempt to apply to a dome on so large a scale a device of recent invention, namely that of a skeleton or organic framework in brick, used for the first time under Alexander Severus in the calidarium of the *Thermae of Agrippa*.

As the dome had no central opening at the top there seems to have been an idea of making small windows in the vault, for there are traces of two such; but the idea was abandoned, perhaps because it was incompatible with the designs for the decoration of the interior surface. Moreover, it may have been thought that the spacious windows in the drum were sufficient to light the whole structure. Such changes of plan are natural enough. As Brunelleschi (1377-1446) said, 'in building, practice teaches the course which has to be followed'.⁴

On the outside the rotunda was strengthened in the part opposite to the front by two massive buttresses, one of which is still standing, while the other has left traces underground, and is also recorded in drawings.⁵ During the period of settlement the architect must have discovered some dislocating and disintegrating movement threatening the coherence of the structure, and so resorted to this method of reinforcement. The facing with its thin bricks and irregular joints of mortar thicker than those used in the time of the Gordians, and sometimes even wider than the bricks themselves, shows that it is contemporary with the main building (fig. 226).

The Licinian rotunda, so much admired by Isabelle,⁶ was in fact a daring piece of construction for its age. The problem which it solved for the first time was to enable a drum of such height, pierced by large windows, to bear so great a weight and thrust, even though its walls were 1.70 m. (5 ft. 7 in.) thick and strengthened by angle buttresses. We know that dome construction is a most difficult branch of the mechanical part of architecture. And so it takes its place beside the Pantheon as the most scientific and ingenious of all the circular buildings of the ancient Roman world.

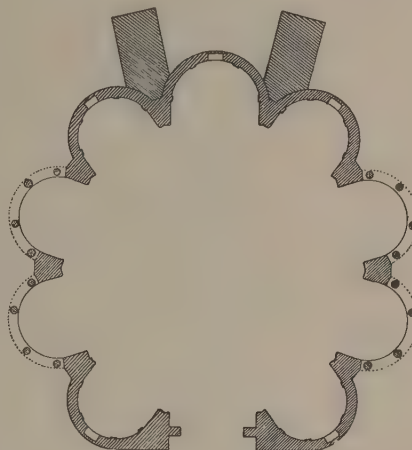


Fig. 224. Plan of the Nymphaeum of the Licinian Gardens

¹ *Cities and Cemeteries of Etruria*, vol. i, p. 217.

² ISABELLE, *op. cit.*, pp. 58-69, pl. xxii-xxiii bis.

³ CHOISY, *L'art de bâtir chez les Romains*, pp. 82-4.

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⁴ GUASTI, *La cupola di Santa Maria del Fiore*, pp. 28-30.

⁵ HUELSEN, *Il libro di Giuliano da Sangallo*, fol. 5, p. 12.

⁶ *Op. cit.*, p. 61.

The plan of the lower stage in its original form is derived from that of the vestibule of the 'Piazza d'Oro' in Hadrian's villa at Tivoli (figs. 147, 148, 149). Thence also came the idea of the organic framework or skeleton, designed to distribute or concentrate the forces of thrust and resistance. The new elements are to be found in the upper stage, where the wall, only 1.70 m. (5 ft. 7 in.) thick,



Fig. 225. Interior of the Nymphaeum of the Licinian Gardens.

was strengthened by buttresses of about 2.90×1.30 m. (8 ft. 10 in. $\times$ 4 ft. 3 in.), and was pierced by windows of such size that the interior must have been exceptionally well lighted.

The vestibule in Hadrian's villa just referred to had, it is true, at an earlier date been provided with external buttresses in the shape of piers connected by arches (fig. 149). The Romans freely used such forms of reinforcement in the re-entrant parts of the circumference of buildings with large recesses, and sometimes of a very substantial nature, as may be seen in the plan of a tomb outside Rome,



Fig. 226. Brickwork of buttress in the Nymphaeum



Fig. 227. Licinian rotunda. Facing of the exedras (fourth century)

preserved by Giuliano da Sangallo.¹ But I do not find that they were employed in circular buildings of two stages before the rotunda we are considering, which is therefore the prototype of the class.

In the next place there is no record of any earlier instance of a drum lighted by windows.



Fig. 228. Tomb of the Calventii near Rome. Elevation and plan
(From *Cod. Vaticanus Lat. 3439*)

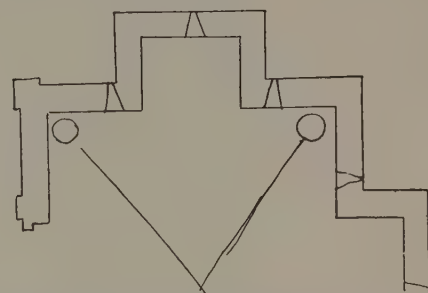


Fig. 229. Tomb of the Cercenii near Rome. Plan.
(From *Cod. Vat. Lat. 3439*)

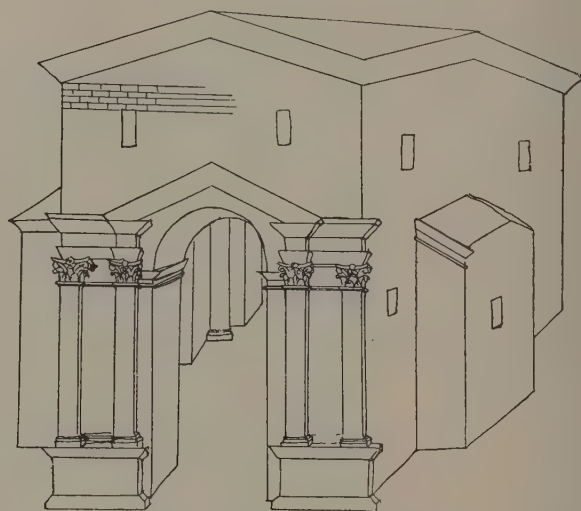


Fig. 230. Elevation of the Tomb of the Cercenii
(From *Cod. Vat. Lat. 3439*)

The architect of SS. Sergius and Bacchus at Constantinople (527) derived so much from the Licinian rotunda that Choisy says the plan of the one seems to be a tracing from the other.² Hence it occurs to me that the architect was Anthemius of Tralles, trying his hand in one of the earliest of Justinian's buildings before venturing on the colossal task of St. Sophia ; and this conjecture is confirmed by the heaviness of architectural effect which is common to both buildings.

¹ HUELSEN, *Il libro di Giuliano da Sangallo*, fol. 8, p. 15.

² *L'art de bâtir chez les Byzantins*, pp. 123, 124.

THE MAUSOLEUM OF GALLIENUS. This half-ruined circular structure, an imaginary reconstruction of which was published by Canina,¹ stands at the ninth milestone on the Via Appia Antica.² The experts are agreed as to the identification. It consists of two stories. In the lower one, the vault of which has numerous ribs, there are six recesses round the interior (one of them being the entrance), corresponding to which are as many similar recesses in the exterior of the circumference wall, which has a diameter of about 13 m. (over 42 ft.). In the upper story the recesses appear again, but only inside. Outside, the wall was decorated with small niches corresponding to the unbroken portions of the wall. Above rose a dome which has disappeared.

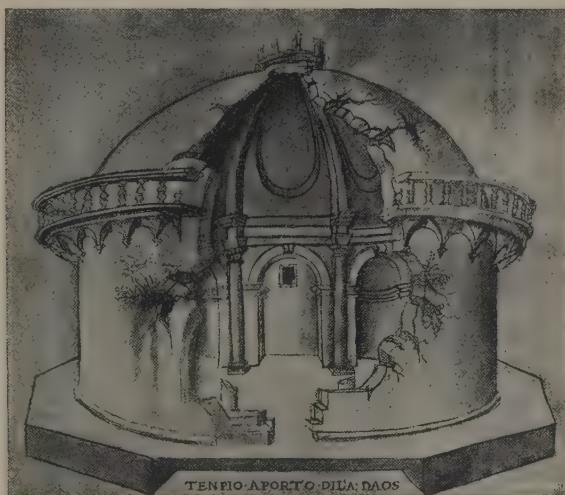


Fig. 231. Porto. ' Temple of Portumnus '

(From a drawing by Sangallo)

The use of narrow bricks and wide mortar joints shows that it belongs to the same period as the hall of the Licinian Gardens, and so the historical and the technical evidence are in agreement.

THE TOMB OF THE CALVENTII. We have the plan and elevation of a tomb on the Via Appia Antica drawn by Ligorio, which is believed to be that of the Calventii, erected in the consulship of Statilius Taurus, who held office in A.D. 44 (fig. 228).³ But it is not certain that the inscriptions on which these dates are based refer, so far as the period is concerned, to the same structure. It is out of the question that a building showing such an advanced stage of statical knowledge could have been erected in the time of Claudius (41-54). There are considerable remains of the tomb in the angle formed between the ancient road and the Via Appia Pignatelli; and they enable us to control the drawing of that very imaginative architect, Ligorio.

¹ *Edifici*, vol. v, pp. 40, 41; vi, tav. xlviii.

² AURELIUS VICTOR, *Incerti auctoris Epitome de Caesaribus*, 40 (p. 164, ed. Teubner).

³ Vatican Library, *Cod. Vat. Lat.*, 3439, fol. 47. *Chronica Minora*, vol. i, p. 468, *Fasti Consulares*. [CLINTON, *Fasti Romani*, i, p. 28.]

The internal diameter is 9.47 m. (31 ft.). Of the six niches, the walls of which are 90 cm. (3 ft.) thick, the one on the north, opposite to the entrance, is larger than the others. On the exterior the spaces between the niches are occupied by pilasters, which diminish in the upper story. The dome, still partly standing, has ribs of three chains of brick with large tiles at intervals, which stop at about 1.50 m. (about 5 ft.) from the circular impost, that is to say, at the level to which the drum is built up outside to counteract the thrust of the vault, and where the buttresses begin. These ribs went right through the vault and stood out above the outer surface of the dome, as may be seen in the illustration. The brick facings seem to be of the same date as those of the Licinian rotunda. We



Fig. 232. Porto. Remains of ' Temple of Portumnus '

gather from Ligorio that on the outside they were faced with stucco imitating stonework.

The point to notice in the tomb of the Calventii is the articulation of the material applied in a new way to the dome. So far as I know, no other spherical vault of the Roman Imperial epoch has ribs standing out above the domical surface, the thrust being met by the buttresses of the drum. This idea contains the germ of the ribbed domes of Arabic, Medieval, and Renaissance Architecture.

The date of the tomb, of which there are also two views by Labruzzi,¹ is later than the reigns of Septimius Severus and Caracalla, as is proved by the ribbing of the dome; and is probably that suggested by the brickwork, in other words the time of Gallienus, whose rotunda suggested the plan, the angle buttresses, and the insertion of windows in the drum.

Opposite to this tomb is the ruin of that of the Cercenii, drawings of which were made by Ligorio² (figs. 229, 230). It was cruciform with multiplied angles, and the central space was covered by a cross-vault springing from shafts in the

¹ Rome, Academy of St. Luke, Biblioteca Sarti, *Via Appia illustrata*, vol. i, fols. 22-4.

² Vatican Library, *Cod. Vat. Lat.*, 3439, fol. 38.



Fig. 233. Rome. The Imperial Mausoleum at the Vatican
(From a painting in the Vatican Library)

angles. The walling shows that it too belongs to about the middle of the third century.

This common tomb of freedmen is interesting on account of the lunette arches of the central vault, in which windows are pierced (as may be seen in some medieval churches),¹ and also by reason of the fact that above each of the isolated columns



Fig. 234. Ostia. Corbelled raking arches



Fig. 235. Capua. Remains of Roman Mausoleum (second century A.D.)

of the central space is a piece of broken architrave set on the column like a pulvin or impost block.

The round building at Porto known as the TEMPLE OF PORTUMNUS. The remains of this singular structure of sepulchral type stand near the port formed by Trajan between 100 and 106.² The plan and elevation are preserved in drawings

¹ RIVOIRA, *Lombardic Architecture*, vol. i, p. 225.

Dissertazioni, vol. x, ser. 2, part ii, pp. 71, 72, PASCHETTO, *Ostia*.

² *Pontificia Accad. Rom. di Archeologia*;

by Giuliano da Sangallo in the Vatican Library (fig. 231).¹ Of the original structure with its seven recesses (not including the entrance), alternately rectangular and curved, round the interior of the circumference wall, there survive three piers and two recesses with the drum above them, and the base of the dome (fig. 232). The piers are 2 m. (6 ft. 6 in.) wide, and have a thickness of 2.20 m. (7 ft. 2 in.). The recesses are 3.70 m. (about 12 ft.) wide, and the frontal arches have two rings. Up to the spring of the dome the facings are of thin bricks with wide mortar joints, pointing to the middle of the third century, and characteristic of the age of the Licinii. Above each pier a rib starts, measuring 0.70 × 0.80 m. (2 ft. 4 in. × 2 ft. 8 in.) at the base. They converge towards the opening at the top, diminishing as they

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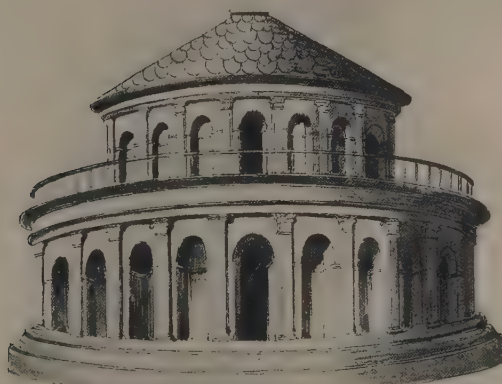


Fig. 236. Capua. Roman Mausoleum
(From a drawing by Giuliano da Sangallo)

ascend, and are faced with brick up to the curve of the dome, but have now lost the marble columns which originally supported them. The dome, which was 14.50 m. (nearly 48 ft.) in diameter, like the core of the walls from which it rises, is formed of tufa concrete with some admixture of marble chippings.

On the exterior, at the impost line, was a range of large arched brackets (the lunettes and consoles are brick; the rest is of the same materials as the dome) supporting a service gallery or balcony. Whether it really had the balustrade shown by Sangallo, or some other kind of railing, we cannot tell. The earliest instance of a balcony round the exterior of a circular building is that of the Pantheon (p. 124). Below is a crypt, in which the half-domes of the niches are strengthened by meridian ribs. For the reasons given in the case of the tomb of the Calventii, this circular building must be of about the same date. The features which call for notice are as follows.

(1) The dome provided with substantial meridian ribs projecting boldly from

¹ *Cod. Vat. Barb. Lat.*, 4424. HUELSEN, *Il libro di Giuliano Sangallo*, fol. 37, p. 54.

the face of the vault. Their object was not only to strengthen the dome by dividing it into sections, but also to secure it from movements, while embellishing it in a constructional manner.

Rome and its suburbs under the Empire appear to have contained many examples of such vaults, the centering required for which was much simplified, only one section being necessary for the construction, one after another, of the arches forming the ribs. One has only to turn over the pages of Montano to see how numerous they were. His illustrations show the use (as in the rotunda of Porto) of lines rising to the central opening of the dome or the keystone, emphasizing the columns below from which they start, and continued on the intrados by the meridian ribs which form the constructional skeleton of the dome itself. They also illustrate the simpler form of visible meridian bands of brick.¹

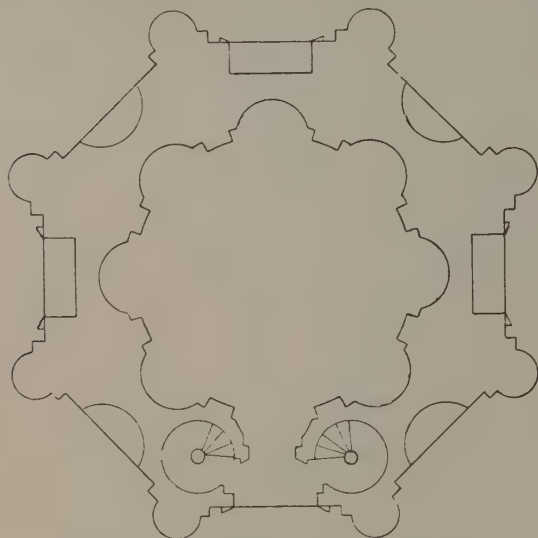


Fig. 237. Rome. Plan of polygonal building

(From MONGERI, *Rovine*, tav. 29)

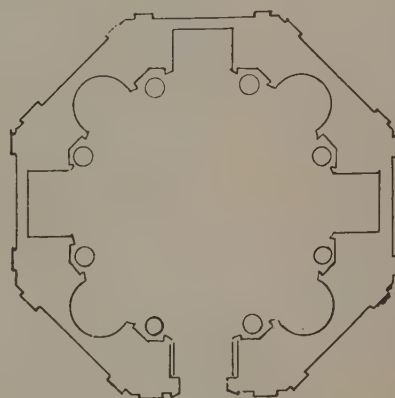


Fig. 238. Rome. Plan of polygonal building

(From MONGERI, *Rovine*, tav. 33)

The objection might be raised that while such illustrations (assuming that they are not mere copies of older ones) are generally accurate, or approximately so, in the case of the plans, on the other hand, though many of the elevations (except for purely imaginary accessories) are based on actual remains, others are due to imagination. But those which we have mentioned must more or less represent actual structures; for, in spite of the small number of round buildings figured in the Vatican Barberini Latin MS. 4424, two of them have visible ribs in the dome, viz. the above-mentioned example at Porto, and another the plan of which is preserved by Francesco da Sangallo (1494-1576).²

The same method of reinforcement appears at a later date in the Imperial Mausoleum (Mausoleum Augustorum) connected with the Vatican Basilica (fig. 233), a work of the fifth century, consisting of two rotundas (known as Santa Petro-

¹ *Scelta de varii tempietti antichi*, tavv. 29, 38. *Raccolta de tempii*, &c., tavv. 3, 6, II, 2I, 22, 26, 29, 40, 45, 46.

² HUELSEN, *Il libro di Giuliano da Sangallo*, p. 4, fol. I.

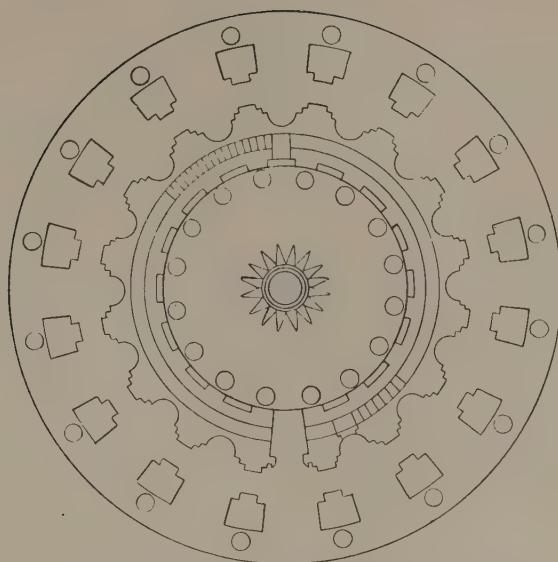


Fig. 239. Rome. Plan of circular building
(From MONGERI, *Rovine*, tav. 53)

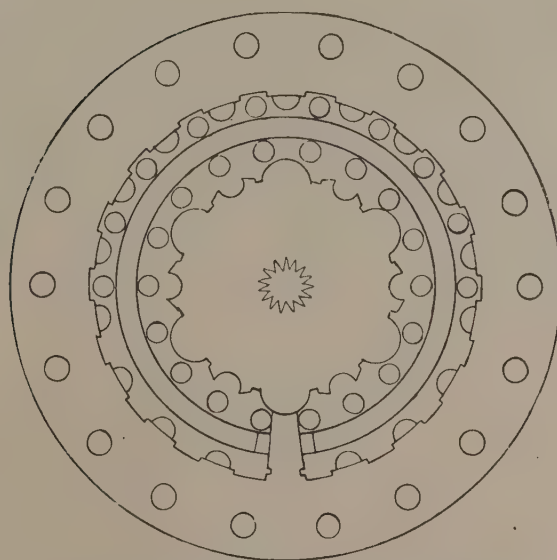


Fig. 240. Rome. Plan of circular building
(From MONGERI, *Rovine*, tav. 54)

nilla, and Sant' Andrea Apostolo or Santa Maria della Febbre) in which were buried Honorius (395-423) and Theodosius II (408-450), and probably also Valentinian III (425-455) and others of the Imperial family.¹

The rotunda of Porto is nearly three centuries earlier than the use of the method (though in an improved form) in St. Sophia at Constantinople (532-537).²

(2) The balcony at the top of the wall carried on a half cross-vault course. In the House of Caligula on the Palatine we noticed, on the Forum side, an external balcony, apparently of the time of Domitian, carried on arches springing from large corbels. In the palace of the Gardens of Sallust we found balconies supported by semicircular arches. In the Baths of Caracalla, in a retiring room adjoining the

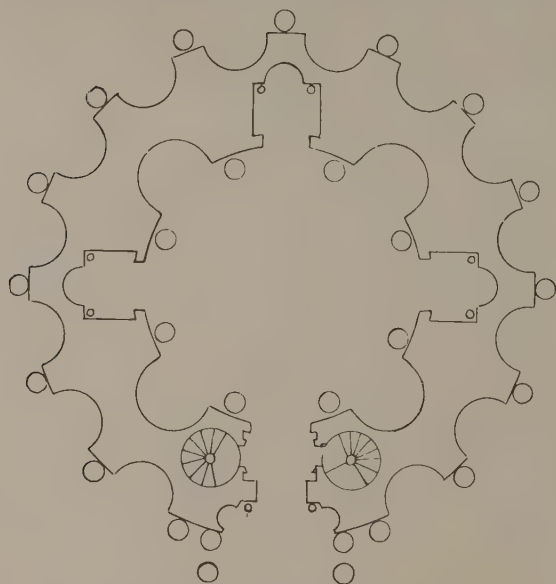


Fig. 241. Rome. Plan of circular building
(From MONGERI, *Rovine*, tav. 69)

so-called tepidarium, there is a balcony with depressed arches resting on corbels built into the wall. The excavations at Ostia have revealed the existence of balconies projecting from the fronts of houses of the end of the first and of about the middle of the second century. Moreover, another kind of balcony has been discovered, formed by sections of a vault, recalling that of the 'Temple of Portumnus', which seem to have been in some cases decorated with inserted bowls or saucers of reddish pottery with a greenish vitreous glaze.³ Lastly, there has been brought to light a curious example of corbelled raking arches, perhaps carrying a waterpipe (fig. 234). These works may be ascribed to the years preceding the opening of the fourth century, when the port of Rome entered on a period of rapid decline.⁴

This singular addition to the

rotunda of Porto is the predecessor of the sentinels' galleries of medieval towers, carried on corbel courses.

Before quitting the structure at Porto we should note that, at an earlier date, the imposing tomb known as the 'Carceri Vecchie' on the left side of the Via

¹ DE ROSSI, *Inscriptiones Christianae Urbis Romae*, vol. ii, pp. 224-34, tav. p. 229. *Bull. di arch. crist.*, 1878, pp. 125-46, DE ROSSI, *Sepolcro di S. Petronilla*. CANCELLIERI, *De Secretariis Bas. Vat.*, vol. iii, tavv. iv, v. GRIMALDI, *Relazione manoscritta della Bas. Vaticana*, fol. 44 (Capitular Archives of St. Peter's, Instrumenta autentica, G. 13). Rome, Biblioteca Casanatense, Cod. 2421, fol. 30, GRIMALDI, *Catalogus sacrarum reliquiarum Vaticanae Basilicae*. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 82, 83 [fig. 130 shows the interior

of the Mausoleum].

² RIVOIRA, *ibid.*, p. 81.

³ *Notizie degli scavi*, ser. v, vol. xii (1915), pp. 324-7, CALZA, *Ostia, Le pergulae e i maeniana delle case Ostiensi*; xiii (1916), pp. 399-428, PARIBENI, *Ostia, Scavo dell' isola id est dell' area sacra del tempio di Vulcano*; xiv (1917), pp. 312-28, CALZA, *La casa detta di Diana*.

⁴ *Pontif. Accad. Rom. di Arch., Dissertazioni*, ser. 2, vol. x, part 2, pp. 83-94, PASCHETTO, *Ostia*.

Appia outside Santa Maria Capua Vetere, of which there are still striking remains belonging to the second century, had in the space left by the setting back of the upper story an open passage round the exterior (fig. 235). Whether it was originally protected by a railing, as shown in Sangallo's elevation (fig. 236),¹ or by some other form of parapet, we do not know.

It was from a monument of this nature, or from other similar Roman round buildings with recessed niches both inside and out, plans of some of which are here



Fig. 242. Ravenna. Mausoleum of Theodoric
(From a drawing by Sangallo)

reproduced (figs. 237, 238, 239, 240, 241),² that the designer of the Mausoleum of Theodoric (493-526) at Ravenna, erected by his order about the year 519,³ must have derived his conception. A drawing of the elevation by Sangallo shows it in a more complete state than to-day⁴ (fig. 242).

The architect may have been Aloisius⁵ or Aloisius⁶, who was employed

¹ HUELSEN, *Il libro di Giuliano da Sangallo*, fol. 8, pp. 15, 16.

² MONGERI, *Le rovine di Roma al principio del sec. xvi, Studio del Bramantino* (Bartolomeo Suardi), tavv. xxix, xxxiii, liii, liv, lxix.

³ *Mon. Germ. Hist., Auctores antiquiss., Chronica Minora*, vol. i, pp. 322-8, Anon. *Valesiani pars posterior*.

⁴ HUELSEN, *Libro di G. da Sangallo*, fol. 38, p. 54. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 53-5.

⁵ *Mon. Germ. Hist., Auct. antiquiss.*, vol. xii, CASSIODORUS, *Variae*, ii, 34.

⁶ PAULY-WISSOWA, *Real Encycl.*, vol. i, col. 1594.

by the second king of Italy, with the marble worker Daniel as his assistant.¹ Or he may have been Julianus Argentarius, the distinguished architect of San Vitale at Ravenna (526-547),² a Latin work,³ and not a Byzantine one, as some still try to make out.⁴ This Julianus, the rival of Anthemius of Tralles and Isidorus of Miletus, was not called Argentarius because he was the treasurer



Fig. 243. Mausoleum of Theodoric at Ravenna (about A.D. 519)

(argentarius) of the Church of Ravenna, as Bacchini thought ('crediderim itaque Julianum istum Ecclesiae Ravennatis Argentarium fuisse');⁵ and his own surname may have come from his place of origin, Argenta, founded by the Argentani about A.D. 300, and finished under Exuperantius, who was Archbishop of Ravenna between 425 and 432 or 439.⁶ This conjecture was suggested to me by Mgr. Ratti,

¹ CASSIODORUS, *Variae*, ii, 19.

² *Mon. Germ. Hist., Script. rerum langobardicarum*, AGNELUS, *Liber pontificalis Eccl. Rav.*, pp. 318, 319, 322, 330, 352. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 64-6; *Moslem Architecture*, pp. 318, 319.

³ SAVINI, *Per i monumenti e per la storia di*

Ravenna, pp. 113-15. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 56-72.

⁴ DIEHL, *Ravenne*, pp. 71, 72.

⁵ BACCHINI, *Agnelli qui et Andreas liber pontificalis, Vita S. Ecclesii*, p. 56.

⁶ BERTOLDI, *Memorie storiche d'Argenta*, vol. i, pp. 92-104. *Studi Storici*, vol. vii, p. 401,

the Prefect of the Vatican Library.¹ However that may be, he certainly was not a Goth, any more than the impressive mausoleum is Gothic, for it is not, as some imaginative writers have fancied, a typical monument of the northern barbarians of the period, to whom Troya (1784-1858) ascribed the introduction and subsequent diffusion in Europe of an architecture invented by himself, viz. the Transdanubian style.²

Theodoric was proud of displaying his Roman feeling and admiration for the monuments of Rome, as we learn from Ennodius (c. 473-521)³ and Cassiodorus (490-c. 583).⁴ He wanted to be a Roman king.⁵ He employed Aloisius and Daniel, certainly not Goths, who left all professional work to the Romans; and we know that Julianus Argentarius came of a family which was settled at Ravenna.⁶ Rome and Italy were plentifully provided with sepulchral edifices which could be used as models for the royal mausoleum. It is, therefore, inconceivable that a barbarian should be invited to design a building of Roman style and construction, or that he could have displayed the exceptional ability required for fixing in place the wonderful monolith cupola (fig. 243).

The idea that the Italian buildings of that age were the work of the German races is mythical. Long ago Hübsch (1795-1863) banished to the realm of dreams the portentous genius and activity of those races, and their claim to wield the sceptre of religious art and create at one stroke the Christian sanctuary proper.⁷

GIANI, *Alcune osservazioni sulla cronologia di Agnello Ravennate*.

¹ [It need scarcely be added that Mgr. (afterwards Cardinal) Ratti is the present occupant of the Papal throne, Pius XI. It may be pointed out that Argentarius was a recognized Roman name, as well as a professional description. See the Indices to the *Corpus*, &c. Of the latter class in the epitaph (A.D. 557) of a *Julianus arg(en)t(ari)us* at Rome (C. I. L., vi, 9163).]

² TROYA, *Storia d' Italia del Medio-Evo*, vol.

iv, pp. 1-96, *Della Architettura Gotica*.

³ *Mon. Germ. Hist., Auct. antiquiss.*, vol. vii, ENNODIUS, *Panegyricus dictus Theodorico*, xi (p. 210).

⁴ CASSIODORUS, *Variae*, vii, 15.

⁵ AGNELUS, *Liber pontificalis*, p. 304.

⁶ [RIVOIRA, *Lombardic Architecture*, vol. i, p. 65; *Moslem Architecture*, p. 318.]

⁷ HÜBSCH, *Monuments de l'architecture chrétienne depuis Constantin jusqu'à Charlemagne*, col. xxix.



XIII. AURELIAN

THE barbarian invasion of 271, which penetrated to the banks of the Metaurus, induced Aurelian (270-275) to surround Rome with walls. They were finished by Probus (276-282) (figs. 244, 245).¹

Omitting his other great work, the so-called temple of the Sun on the Quirinal, which does not enter the field of our studies, we will say something in passing about the walls, on account of their arched galleries intended for circulation and defence. Corridors of this kind were used by the Romans as long ago as the time of Julius Caesar (100-44 B.C.), as we saw when we were discussing the Roman walls of Turin. Their origin is to be sought in fortifications such as the walls of the acropolis of Tiryns (built, it is supposed, in the seventeenth century B.C.²), the south side of which is penetrated by galleries and chambers ;³ or else in the principal wall of Babylon, on the summit of which was a range of chambers looking outwards and inwards, divided by a wide passage ;⁴ or again in the walls of Carthage with their ranges of casemates, razed to the ground by Scipio Aemilianus (146 B.C.).⁵

Passage-ways such as those in the walls of Aurelian suggested the idea of the typical passages, accessible, visible, and taken out of the thickness of the walls, combining both a practical and a decorative purpose, which William of Volpiano introduced for the first time in the abbey church of Bernay (1013).⁶

¹ *Script. Hist. Aug.*, VOPISCUS, *Aurelianus*, 21, 39. *Corp. Hist. Byz.*, ZOSIMUS, i, 49.

² DE ROCHAS D'AIGLUN, *Principes de la fortification antique*, pp. 101, 102.

³ PERROT, CHAPIEZ, *History of Art in Primitive Greece*, vol. i, pp. 266 ff. BURY, *History of*

Greece, p. 21.

⁴ HERODOTUS, i, 179.

⁵ MOMMSEN, *History of Rome* (popular edition), vol. iii, p. 39.

⁶ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 69, 70.



Fig. 244. Rome. The Aurelian Wall. Interior
(near the Porta Pinciana)



Fig. 245. The Aurelian Wall. Interior
(near the Porta Latina)



XIV. DIOCLETIAN

AS a result of the great fire which devastated the Forum in 283 under the Emperors Carinus and Numerianus (283-284),¹ the reign of Diocletian (284-305) and Maximian (286-305) was for Rome one of notable activity in building, and of exceptional advance in the treatment of problems of construction and equipoise. Among the edifices restored or erected at this time we will consider the Curia Julia, the Basilica Julia, and the Baths of Diocletian.

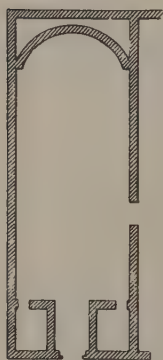


Fig. 246. Rome.
Plan of the 'Secretarium Senatus'

THE CURIA JULIA or Senate House was burned in the fire of 283, and was rebuilt in the name of the Senate.² It appears to have been finished about 303 or 304.³

Our interest is not with the Curia itself, which has nothing new to offer except the carved consoles which support the cornice, the earliest of the kind; and where the only other thing to notice is the pair of service stairs flanking the entrance, which suggest the twin towers of church fronts.⁴ What interests us is the 'Secretarium Senatus', now Santa Martina, standing beside it, restored in 412 after its destruction apparently in 410 by Alaric.⁵ The peculiar features of this are the separation of the apse from the back wall, and the pair of rooms which flank the entrance (fig. 246). The latter arrangement is the predecessor of the narthex confined between two chambers, or two turrets, as in Sant' Apollinare in Classe (535-549) and various churches in the East.⁶

THE BASILICA JULIA was rebuilt after the fire of 283;⁷ and in 377 was restored by Probianus, the City Prefect⁸ (fig. 247).

¹ *Chronica Minora*, vol. i, *Chronicon* a. 334, p. 121.

² *Ibid.*

³ DE RUGGIERO, *Il Foro Romano*, p. 343.

⁴ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 50, 120, 121.

⁵ DE RUGGIERO, *op. cit.*, pp. 340-2.

⁶ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 46, 47. DE VOGÜÉ, *Syrie Centrale*. RAMSAY, BELL, *The thousand and one Churches*, pp. 313, 315.

⁷ *Chronica Minora*, vol. i, *Chronicon* a. 334 p. 121.

⁸ *C. I. L.*, vi. 1156 b, 1658. [DESSAU, 5537.]

Passing over the fact that the building was not enclosed by walls, like the other basilicas, we will call attention to the existence in four angles of the aisles of a



Fig. 247. Rome. Forum. Remains of the Basilica Julia

cruciform pier provided with angle supports for springing the groins of the cross-vaulting (fig. 248). For it was certainly with such that the aisles on the ground floor were roofed, and not with barrel-vaults, as has been asserted.¹ Any one who examines with a practised eye the surviving original pier with its angle

¹ DE RUGGIERO, *op. cit.*, p. 419. HUELSEN, *Foro Romano*, p. 54.

supports, as well as the remains (also original) of the longitudinal and transverse arches and the spring of the vaulting, can satisfy himself at the first glance that the facts are as I have stated.

These piers are important because they lead up to the compound Lombardic pier,¹ being the dated prototype of that form of support. For though a drawing by Fra Giocondo (1435-1515)² of an ancient building at Rome shows two cruciform piers with their half-piers and columns, provided with two angle supports for springing the cross-vaulting, the building has not yet been identified,³ and we do not know its date (fig. 249). In the same drawing we may also notice that piers alternate with columns; and the large outer piers show how little truth there is in Courajod's assertion that in Roman architecture the engaged column had only a decorative value.⁴

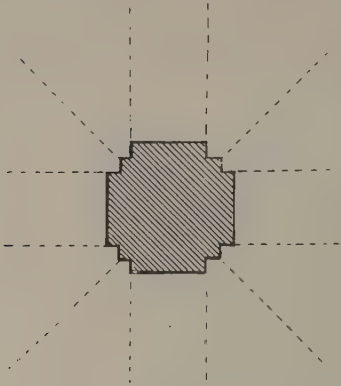


Fig. 248. Plan of a pier in the Basilica Julia

THE THERMAE OF DIOCLETIAN were erected by him and Maximian,⁵ finished in 305,⁶ and dedicated in 306⁷ (fig. 250). They resembled the Baths of Caracalla, but were on a grander scale and more splendid. Ruccellai, who saw them in 1450, called them 'very wonderful'.⁸ We have many drawings of them and various plans, besides restorations, carried out on strictly architectonic lines like the one by Palladio,⁹ or with the double aim of showing them both in construction and in perspective like the one by Paulin.

In this vast building I shall confine myself to a study of the great central hall (the so-called tepidarium) and its immediate dependencies, forming the principal nucleus of the central block, the plan (fig. 251) being taken from Paulin.¹⁰ I do so in view of the features which it offers and the influence which they exercised, in the matter of planning, construction, and equipoise, on the great architectural styles of the future. These facts, which elsewhere I had already set out in a new light,¹¹ I hope now to make clearer.

The great hall, together with the circular vestibule or 'calidarium' and in part the 'frigidarium'¹² also, was still intact when, between 1563 and 1566, Michelangelo transformed it into the church of Santa Maria degli Angeli¹³ (fig. 252).

¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 74, 75.

² FERRI, *Indice dei disegni di architettura nella R. Galleria degli Uffizi*, Teatro Marcello, Ricordo in pianta ed in alzato, n. 125, p. 192.

³ HUELSEN, *Il libro di Giuliano da Sangallo*, pp. 5, 6.

⁴ COURAJOD, *Leçons professées à l'École du Louvre*, vol. i, p. 471.

⁵ *Chronica Minora*, vol. i, *Chronicon* a. 334, p. 121.

⁶ MIGNE, *Patr. lat.*, vol. xxvii, col. 493, HIERONYMUS, *Eusebii Chronica*. [FOTHERINGHAM, op. cit., p. 309.]

⁷ *C. I. L.*, vi, 1130, 31242. [DESSAU, 646.]

⁸ *Archivio della Società Romana di Storia*

Patria, vol. iv, pp. 563-80, *Il Giubileo dell' anno 1450 secondo una relazione di Giovanni Ruccellai*.

⁹ BERTOTTI, SCAMOZZI, *Le Terme dei Romani disegnate da Palladio*, tavv. xi-xiii.

¹⁰ *Restauration des Termes de Dioclétien* (Paris, 1890), pls. viii, ix.

¹¹ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 75-81.

¹² [In JORDAN, HUELSEN, *Topographie*, &c., vol. i³, p. 381, the two latter rooms are called the tepidarium and calidarium respectively.]

¹³ LANCIANI, *Storia degli scavi*, vol. ii, p. 137. C. RICCI, *S. Maria degli Angeli e le Terme Diocleziane*.

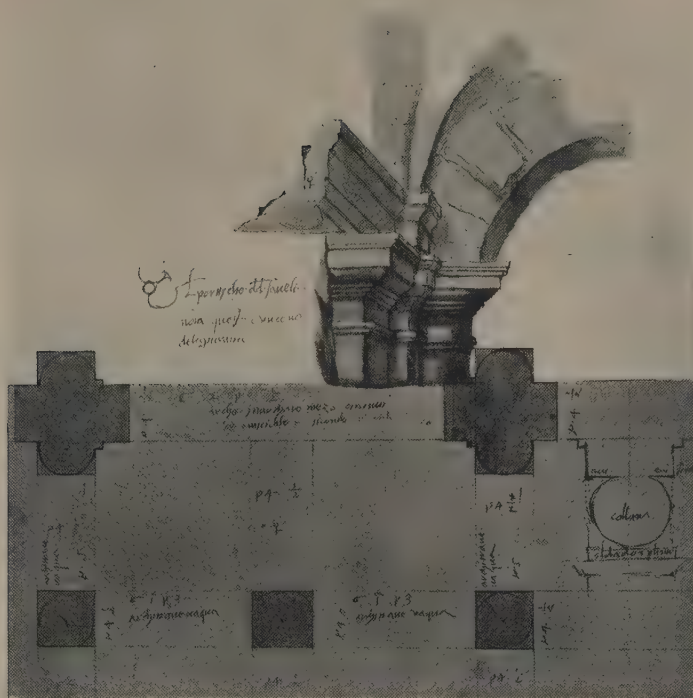


Fig. 249. Drawing by Fra Giocondo in the Uffizi of a portico ascribed to the Theatre of Marcellus



Fig. 250. Rome. Thermae of Diocletian. General view of the principal remains (Santa Maria degli Angeli)

I. The rotunda through which the great hall is reached is set between four towers, of which those in front are circular and merely intended for staircases, while the others are rectangular and serve both for staircases and also as outer buttresses for the middle bay of the hall. As is obvious, they contain the germ of the principle which dominates the basilica of San Lorenzo Maggiore at Milan, 'edita in turribus',¹ erected in the sixth century, and, from its style, possibly the work of Julianus Argentarius.²

The great central hall, while based on the principles of equilibrium displayed in the Baths of Caracalla, possesses new elements contributing to the stability of

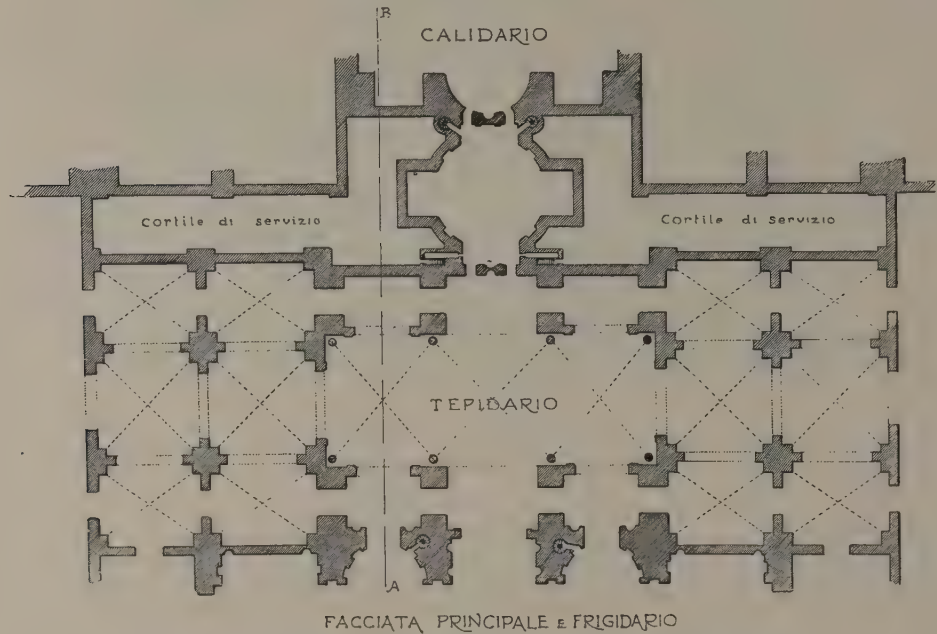


Fig. 251. Thermae of Diocletian. Plan of the central block
(From PAULIN)

the structure and its uses (fig. 253). Given the great size of the hall, the largest in the whole building, measuring about 58×23 m. (about 200×80 ft.), and the span of the three bays of cross-vaulting which cover it, and considering the weakness of their diagonal semi-elliptical ribs on which the thrusts converge, the architect was not satisfied with diminishing the thrust by making the vault-webs of tufa only, or tufa mixed with bits of black pumice, or black and white pumice with a small amount of tile—at any rate these are the materials of the webs in the other cross-vaults of the building. Nor was he content with springing the great diagonal compartmented ribs from high bases resting on columns surmounted by corniced pieces of architrave. In order to safeguard the structure more surely from dislocating and damaging movements during the settlement of the vaulting material, he had recourse to the following methods of consolidation.

He applied to the south-west side (fig. 254) four raking buttresses, correspond-

¹ MURATORI, *Rerum Italicarum Scriptores*, vol. ii, part 2, p. 689, *Versus de Mediolano*.

² RIVOIRA, *Moslem Architecture*, pp. 131–286.

ing to the transverse walls of three of the smaller side-rooms of the tepidarium, two of which contained baths, while the third formed a passage-way. Each buttress was lightened by a communication-arch, and carried on its back the flight of steps which gave access to the saddle-back roofs of the great hall. Of these abutments the two outer ones, which adjoined two service court-yards, discharged their thrust outwards on to massive buttresses, while the two intermediate ones had to rely on the support of the substantial staircase towers.

On the north-eastern or principal front looking towards the Piscina and the entrance to the *Thermae*, he used four rectangular buttresses, rising above the trans-



Fig. 252. *Thermae* of Diocletian. Circular hall, now the vestibule of Santa Maria degli Angeli

verse walls of the three corresponding side-rooms of the central hall, for they were not of the raking form which Choisy gives them.¹ The stairs to the roof in this case were inside the buttresses, which ended in massive projections built up higher than the roof, two of which contained spiral stairs (fig. 255). Finally, he supported the ends of the great hall by cross-vaulted bays which had stout ribs (fig. 256), secured both by the massive angle piers from which they sprang, and by substantial buttresses outside.

This scientific system of thrusts and counter-thrusts, with which there is nothing to compare before Diocletian, was the source of several important ideas. Thus Anthemius, who made the plans for St. Sophia at Constantinople, found here the suggestion for the four tower-like buttresses on the north and south, altered

¹ *L'art de bâtir chez les Romains*, fig. 54.

later by the younger Isidorus. These four buttresses, through the same number of intermediate arches, receive the thrust of the four great arches transmitted by the piers of the central dome. So in San Vitale at Ravenna, the piers of the dome were reinforced by connecting them through arches with the massive angle buttresses outside.

Anthemius in all probability had been in Rome, where one of his brothers practised medicine.¹ The analogies between St. Sophia and the great buildings of Rome are in favour of this suggestion. Its plan is derived from the central hall (tepidarium) of the *Thermae* of Agrippa and of Alexander Severus, as known from Palladio's drawings;² and still more from the 'Basilica Nova' of Maxentius.³ The visible ribs in the half-domes of the church had been used in Roman domes from the third century onwards. We do not know what was the form of the



Fig. 253. *Thermae* of Diocletian. Section through the great hall, &c.
(From a drawing by the author)

first dome, destroyed by the earthquake of 557 and rebuilt by the younger Isidorus between that year and 562,⁴ but it is supposed to have been a simple dome. Again, the practice of piercing windows in spherical vaults, which appears in the half-domes of St. Sophia, was a Roman one and known in the time of Hadrian: the dome of the large octagonal hall of the Baths of Diocletian, situated at the angle of the Via Cernaia, is a good example of it. Moreover, the piers or mullions dividing the great lunette windows were to be found both in the Roman *Thermae* and in the Basilica Nova, where also small columns were used for the same purpose. But, above all, it is the constructional heaviness of St. Sophia that betrays its Roman inspiration and declares its descent from the aforesaid *Thermae* and Basilica; especially to one who can go round the exterior, and compare the actual building with those at Rome.⁵ A similar heaviness of effect and an impression like that conveyed by the Roman *Thermae* meets one in Justinian's church of St. Irene at Constantinople, as rebuilt after the earthquake of 740.

¹ *Corp. Script. Hist. Byz.*, AGATHIAS, v, 6, 7.

² BERTOTTI, SCAMOZZI, *Palladio, Le Terme dei Romani*, tav. i.

³ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 66, 67.

⁴ *Corp. Script. Hist. Byz.*, AGATHIAS, v, 9. *Chronicon Paschale*, vol. i, p. 687. THEOPHANES, *Chronographia*, vol. i, pp. 359, 360.

⁵ RIVOIRA, *Moslem Architecture*, p. 323.



Fig. 254. Thermae of Diocletian. Buttresses on the north-eastern side of the great hall. (From the Cloister)



Fig. 255. Thermae of Diocletian. South-western side with present entrance to the church

The Lombard gilds also got ideas from the great hall of the Baths of Diocletian, for they borrowed from it the idea of raking buttresses built up high and pierced with arches, as in San Babila at Milan (eleventh century) and in the church

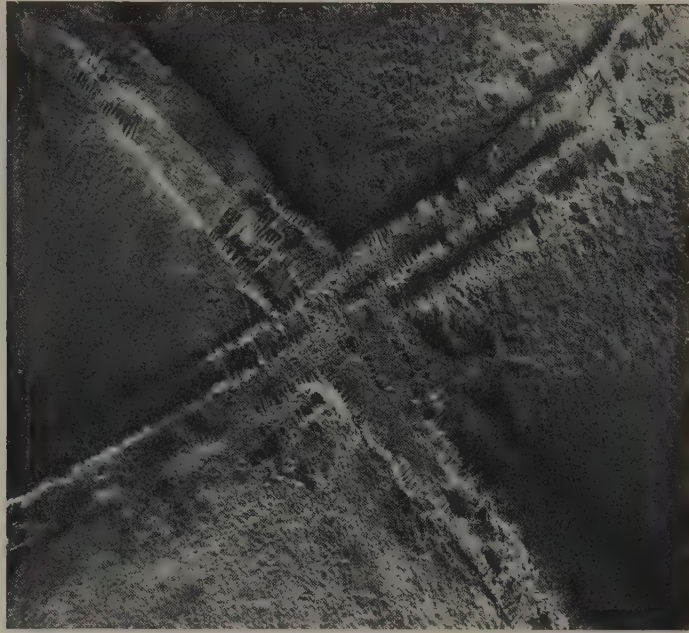


Fig. 256. Thermae of Diocletian. Ribbed cross-vault



Fig. 257. Thermae of Diocletian. Exterior of one side of the central block
(From a fifteenth-century drawing in the Uffizi)

of Rivolta d'Adda (eleventh century). And from that was developed the flying buttress of the Pointed style.

Before leaving the Baths of Diocletian I may call attention to the feature of porches in front of the doors, as shown in an anonymous drawing of the fifteenth century (fig. 257).¹

¹ FERRI, *op. cit.*, no. 1863, p. 203.



XV. MAXENTIUS

THE reign of Maxentius (306–312) saw the zenith of the art of construction on the grand scale in the service of the Empire, and this was due not only to the impulse it had received in the preceding reign, but also to the conditions in which the City of Rome found herself at his accession.



Fig. 258. Rome. The Basilica of Constantine or 'Basilica Nova'

Rome had seen herself despoiled of the rank and authority of a capital in favour of the great army head-quarters, Milan, Trier, Sirmium, and Nicomedia. Septimius Severus had already severed nearly all the slender ties which connected the Senate with the emperor and the people; and by executions and by the introduction of members of Eastern origin, naturally prone to the arts of dissimulation and adulation, he had rendered it more subservient to the monarch's will.

This body now, after a temporary restoration of its powers by Probus, was stripped of almost the last remains of its position of intermediary between the emperor and the army, and was deprived of its most distinguished members, who were sacrificed under the pretext of imaginary conspiracies. The populace was discontented at the prolonged absence of the emperors. The privileges of the Praetorians had been abolished and their numbers reduced, their place being taken by Illyrian legions acting as the Imperial Guards. The well-to-do classes were on the verge of rebellion, owing to the city having been made one of the tax-paying communities of the Empire.

Maxentius, on his proclamation as Caesar, desired, both by his maxims of government and by his residence, to deserve the title. He called himself 'Conservator Urbis Suae', as we learn from some of his coins;¹ he extolled the idea of Roman ascendancy, of which by his public acts he made himself the defender and guardian; and in his short and stormy principate he erected buildings which were worthy of the Eternal City.

The Latin craftsmen responded to the intentions and the action of the sovereign, and as though they foresaw the approach of the day when Rome would have to yield up her sceptre to Byzantium, they roused themselves to illuminate her with a brilliant ray of light in which her grandeur, now on the verge of extinction, should be concentrated.

The most important of the buildings of Maxentius were the Basilica Nova and the temple of Venus and Roma. We must also give some account of the mausoleum, circus, and temple of the deified Romulus, or 'Heroon Romuli'.

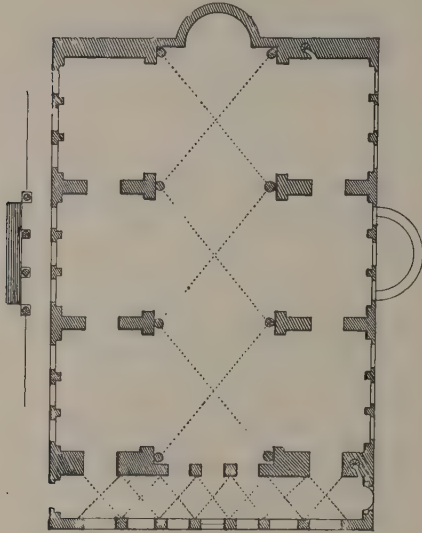


Fig. 259. Plan of the Basilica of Constantine

THE BASILICA NOVA or Basilica of Constantine was erected by Maxentius. Constantine gave the finishing touches, made some alterations, and dedicated it soon after 312.²

It was the last, the largest in bulk, the most remarkable of the basilicas of Imperial Rome; and it was truly Roman in its enormous dimensions, its wonderful construction, the richness of its marble linings and pavements, and its roof of bronze (figs. 258, 259).

It was modelled on the great hall of the Baths of Diocletian, and I think that it was the work of the same chief architect who designed the Baths. It consisted of an oblong, measuring internally 82.40 × 62.70 m. (about 270 ft. × 205 ft.), divided into a nave and aisles by four enormous piers. A portico was attached to the end. The building had one story only, instead of two like the other basilicas in the Forum. I mean, of course, those which were then in existence, the Basilica

¹ COHEN, *Description historique des monnaies frappées sous l'Empire Romain*, vol. vii, pp. 168 ff., nos. 20 and ff.

² AURELIUS VICTOR, *Liber de Caesaribus*, 40. *Chronica Minora*, vol. i, *Chronicon* a. 334, p. 121.

Aemilia and the Basilica Julia. We know nothing about the form of the Porcia (184 B.C.), the Sempronia (169 B.C.), or the Opimia (121 B.C.). The basilica, unrepresented at Rome in 210 B.C.,¹ must be regarded as a Roman creation, for it was the Romans who, deriving it from its origin in the East,² fashioned it into



Fig. 260. Rome. Temple of Venus and Roma

definite types, perfected and generalized it. No other city can show earlier examples than Rome.

The nave, quite 25.30 m. (about 85 ft.) wide and ending in an apse for the tribunal, was roofed by three grand cross-vaults springing from eight columns set against the piers and in the angles, and supported outside by raking buttresses rising above the transverse walls in the aisles below, each of which was lightened by an open arch and carried on its back the steps which gave access to the roof.

¹ LIVY, xxvi, 27.

² LEROUX, *Les origines de l'édifice hypostyle*, pp. 269-341.

The aisles had barrel-vaults. Pottery jars were used in the haunches of the vaults, the material of which largely consisted of volcanic scoriae, as may be seen in the massive fragments lying on the ground.

The aisles were lighted by two tiers of large windows, while the nave had great open lunettes, each divided into three lights. This abundant lighting anticipates by many centuries that of the northern cathedrals in the Pointed style.

Two staircases gave access to the roofs: the southern one led first to the roof of the vestibule, and then to the summit of the building. The simpler form of buttressing the cross-vaults, as compared with the system of the great hall of

the Baths of Diocletian, may be explained by the lessons which were learned from the construction of the latter.¹ The portico had three entrances: the principal one in front with three steps, flanked by three large windows on either side; and two smaller ones at either end.

Under Constantine nothing more than decorative work was done, for the building is clearly all of a piece. In one of the fallen masses of the vaulting a silver coin has been found with the laurelled head of Maxentius on the obverse.

Unfortunately some changes were made which altered for the worse the original design, and produce the effect of three aisles running transversely, instead of longitudinally as they were intended to be. These blemishes consisted in the opening of a new entrance on the side facing the Via Sacra; in breaking an opening in the opposite wall for a new tribunal apse, in which the brackets have figures of Victory in various forms and poses, while the coffers of the half-dome have four orders instead of three as in the vaults of the basilica; and in altering the eastern end of the original portico by converting it into a niche.



Fig. 261. Temple of Venus and Roma
Brickwork of the platform

The gilt-bronze tiles which covered the vaulting were carried off by Pope Honorius I (625-638) to make a roof for St. Peter's.² From that moment must date the beginning of the process of disintegration affecting the roofs. The work was completed by some catastrophe of great severity which caused the collapse of the nave and the aisle next to the Forum. This has been connected with the earthquake of 1349, by which also the ruin of the Coliseum has been explained.³ It must have been of an undulatory character, passing from north-east to south-west. But the exact date of the fall is not ascertained. All we know is that the gigantic structure was still intact in the thirteenth century, for in the added apse Nibby noticed traces of a Christian fresco of that period;⁴ and that by 1455 it was in ruins.⁵

The Basilica of Maxentius was the first to be vaulted throughout, thus making

¹ RIVOIRA, *Le origini dell' Architettura Lombarda* (Loescher), vol. ii, pp. 493, 494. [*Lombardic Architecture*, vol. i, p. 78.]

² DUCHESNE, *Le liber pontificalis*, vol. i, p. 323.

³ LANCIANI, *Ruins and Excavations*, pp. 375, 376.

⁴ NIBBY, *Roma Antica*, vol. ii, p. 248.

⁵ LANCIANI, *Storia degli scavi*, vol. i, p. 62.

it impervious to fire. It is a proof of Wickhoff's statement that 'every product of Egyptian, Oriental, and Greek architecture appears as child's play by the side of the fully developed Roman arch', and that 'in the basilica of Constantine, the problem of how to span a triple nave was solved—as regards breadth and spatial effect and boldness of construction—with a vigour and intelligence unsurpassed even by the builders of medieval cathedrals'.¹ It was this basilica, and not the other two-storied ones in the Forum, which inspired the architects of Constantine's great Christian basilicas in Rome.

THE TEMPLE OF VENUS AND ROMA was erected by Hadrian, and suffered from fire about the year 307 (fig. 260).

We do not know precisely the whole extent of the works carried out by Maxentius, though the Chronicle of the year 334 tells us that in his reign the temple of Roma was burned and rebuilt ('templum Romae arsit et fabricatum est'²). But it is certain that the platform is Hadrian's, as is demonstrated by the brickwork of the side running along the Via Sacra (fig. 261); while the two cellas back to back belong to the rebuilding by Maxentius, as is shown by their construction, which is similar to that of the contemporary Basilica Nova close by; by the numerous brick-stamps of the period which have been found; and by the coffering with three orders in the half-domes of the apses, just like that of the vaulting in the basilica.³ It was this temple, the joint work of Hadrian and Maxentius, and dedicated to Constantine ('urbis fanum atque basilicam Flavii meritis patres sacravere'⁴), that was seen by the emperor Constantius in 356, and reckoned by Ammianus Marcellinus among the wonders of Rome.⁵

The remains of the two cellas show that their plan is not exactly like that published by Nibby, and borrowed from him by so many later writers; for among other things he has, perhaps from a love of symmetry, given the temple four staircases, while it seems to have had only one (fig. 262). I have called attention to this elsewhere,⁶ and it has also been noticed by Platner.⁷

The cellas, which had barrel-vaults, communicated with one another by two doors at the sides of the apses. Ventilation was given by pairs of loopholes one above the other in these flanking walls, providing air passages. At the point of contact the two apses were reinforced by substantial buttresses, each of which was pierced at the base by an opening between the two cellas. At the end of the northern cella there was on the west side a staircase leading to the roofs. The traces of the ramps may be seen in fig. 263.

THE TEMPLE OR HEROON OF THE DEIFIED ROMULUS was erected by Maxentius in honour of his son Romulus who died in 309 (fig. 264). This is established by coins

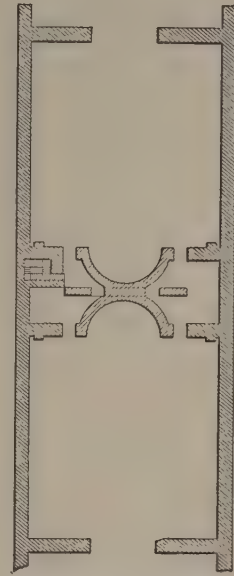


Fig. 262. Plan of the Temple of Venus and Roma

¹ WICKHOFF (STRONG), *Roman Art*, p. 17.

² *Chronica Minora*, vol. i, *Chronicon* a. 334, p. 122.

³ NIBBY, *Roma antica*, ii, pp. 723-40, tav. xxvii.

⁴ AURELIUS VICTOR, *Liber de Caesaribus*, 40.

⁵ AMMIANUS, xvi, 10, 14.

⁶ *Nuova Antologia*, 16 April 1910, RIVOIRA, *Adriano architetto e i monumenti adrianei*.

⁷ PLATNER, *The Topography and Monuments of Ancient Rome*, pp. 316-19.



Fig. 264. Forum Romanum. Temple of the Divus Romulus, now vestibule of SS. Cosma e Damiano



Fig. 263. Temple of Venus and Roma. Traces of the stairs on the north side

of the latter, showing on the reverse a round temple with a cupola.¹ After Maxentius had lost both his throne and his life (312), and his memory had been damned by the Senate, it was dedicated to Constantine,² whose vain and jealous disposition is notorious.³

The temple, flanked by two rectangular rooms with apses, remained almost as perfect as when it was built till the sixteenth century, as appears from a drawing made by Ligorio⁴ (fig. 265). The cupola has a tooth-edged cornice in brick. It is the earliest dated example of this form of architectural decoration that I am acquainted with.⁵



Fig. 265. Drawing by Pirro Ligorio of the temple of Romulus

THE MAUSOLEUM OF ROMULUS, son of Maxentius, was built by Maxentius in 310 or 311.⁶ Derived from the mausoleum of the Gordians, it is distinguished from

¹ COHEN, op. cit., vol. vii, pp. 182-4. [This identification has been seriously impugned by P. B. Whitehead, who believes that Maxentius erected the rotunda of fig. 264 as an entrance-vestibule to the main building (SS. Cosma e Damiano) from the Via Sacra, the site of the Heroon Romuli having to be sought elsewhere, *Nuovo Bull. di Arch. Crist.*, xix (1913), pp. 143 ff.]

² *Bull. Arch. Crist.* (1867), pp. 61-70, DE ROSSI, *Di tre antichi edifizi componenti la chiesa dei SS. Cosma e Damiano*. C. I. L., vi, 1147.

³ AURELIUS VICTOR, *Incerti auctoris Epitome de Caesaribus*, 41.

⁴ Vatican Library, *Cod. Vat. Lat.*, 3439, fol. 40. Paris, Bibliothèque Nationale, *Fonds ital.*, 1129, pp. 341, 342, *Delle antichità di Pirro Legori Napolitano*.

⁵ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 25, 26.

⁶ NIBBY, *Roma antica*, vol. i, pp. 632-44. CANINA, *Edifici*, vol. v, p. 26; vi, tav. xvii.

it by its grand scale and its advanced form. Only the underground part is preserved, reached through a large three-bayed vestibule or portico.

It consists of a central round pier of about 7.50 m. (25 ft.) in diameter, encircled by a barrel-vaulted corridor of about the same width. On the interior face of the outer wall are eight recesses, alternately rectangular and curved, to which correspond as many niches in the central pier. The mausoleum was enclosed by a cloister with stilted arches and cross-vaulting, each bay measuring 8×6.50 m. (about 26 ft. $\times$ 21 ft.) (fig. 266). Owing to the oblong form of the vaulting, and the

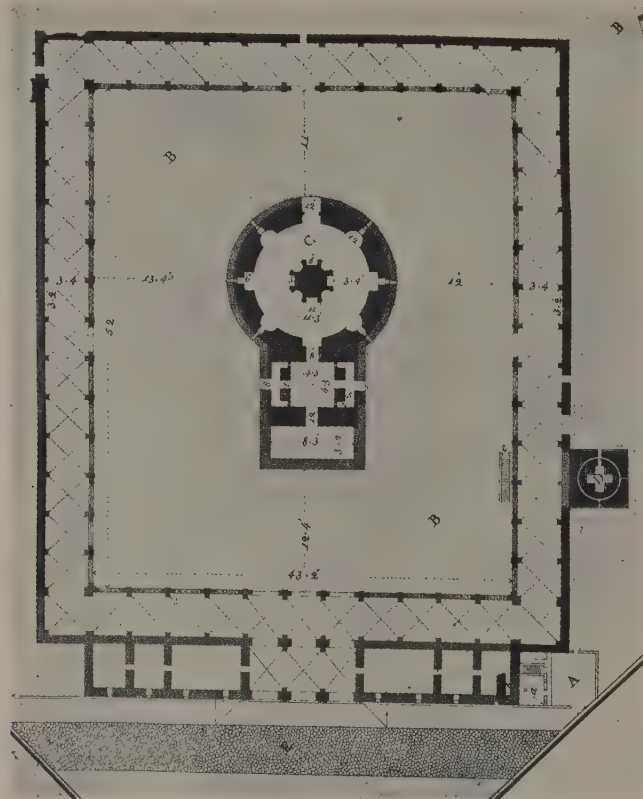


Fig. 266. Plan of the Mausoleum of Romulus.

(From BIANCONI, FEA, *Descrizione dei Cerchi* (Roma, 1789, Tav. 1)

fact that the outer walls were only 0.90 m. (3 ft.) thick, the latter were strengthened by wall-piers on the inside, each 0.90 m. (3 ft.) in width. From these piers and the corresponding cruciform piers opposite, united at the bottom by a low wall which gave them support, the vaulting was sprung. For constructional reasons in each of the corner bays the half-piers are quite 1.80×0.90 m. (6 ft. $\times$ 3 ft.); and the vaulting rests on these, on the corresponding large compound angle pier, and on an angle wall-pier.

The concrete walls are faced with courses alternately of brick and small blocks of tufa roughly shaped with the hammer as oblongs or squares, or merely rough-

hewn. The piers are similar in the part which meets the parapet: the upper part which stands free was built of brick to give them greater solidity.

It is obvious that the structural system of the building is based on the principle of active resistance, the chief aim being lightness of construction, and at the same time economy of expense.



Fig. 267. Circus of Maxentius or Romulus near Rome

THE CIRCUS OF ROMULUS (fig. 267) was also built by Maxentius in 310 or 311, and was dedicated to his son's memory.¹ In size it rivalled the Circus Maximus.² Its construction is just the same as that of the arcaded cloister of the Mausoleum of Romulus. The raking vaults which support the tiers of seats are packed with inverted jars. The object of this was saving of time and money, and, above all, lightness of construction, the vaulting being supported by walls only 1 m. (3 ft. 3 in.) thick and without any buttresses.

¹ *Chronica Minora*, vol. i, *Chronicon* a. 334, p. 122. NIBBY, *Roma Antica*, i, pp. 632-44.

² CANINA, *Edifici*, vol. iii, pp. 59-62; iv, tavv. cxciv, cxcv.



XVI. CONSTANTINE

THE victory 'ad Saxa Rubra' (312), where Maxentius came to a miserable end, gave Constantine possession of Rome, and consequently of Italy and Africa. Above all it bound him to the Christians. It was in fact the monogram of Christ that he had displayed on the much-discussed Labarum,¹ to which the transverse piece on the top of the pole gave, though indirectly, the appearance of a cross. He did so at the time when he was planning to crush his detested rival Maxentius, who had at last alienated the sympathy of every one by his excesses, his suspicious nature, his confiscations, the taxes which he piled upon the senators under the pretext of 'free gifts', the robberies and massacres perpetrated by his soldiers.

And again it was the cross monogram that, when he massed his troops on the Tiber, he had inscribed on his soldiers' shields, in order to inspire them with the certainty of victory. A move, unquestionably, of very astute policy, and followed up by the edict, published in his name and that of Licinius at Milan in 313, confirming and extending the free exercise of the Christian religion, which had been already sanctioned by Galerius in his own name and those of Licinius and Constantine in 311. Other edicts in favour of the Christians followed. This policy was continued, after the defeat of Licinius, by the change of the official religion of the state from Pagan to Christian (324); and was completed by the baptism of the emperor at Nicomedia on the eve of his death. It was a policy which would have justified Constantine in asking his friends on his death-bed, like Augustus, one of the greatest exponents of statecraft and therefore one of the greatest of actors, capable alike of simulation and dissimulation, who has ever existed, whether on this world's stage he had played his part well.²

If this act was destined to carry its author to the height of his power, it also by the fateful course of events conferred on the Church of Rome important and unexpected advantages: the more unexpected when we consider the pagan spirit which then dominated the city.

Thus, while Rome under the first Christian emperor did not see the erection of any public building on a great scale except the *Thermae* which bore his name, and witnessed the termination of a period of steady advance in vault and dome construction, she beheld the erection of a series of splendid Christian basilicas, some

¹ *Studi Romani*, vol. i (1913), pp. 161-86; ii (1914), pp. 216-23, PIO FRANCHI DE' CAVALIERI, *Il labaro descritto da Eusebio; Ancora del labaro descritto da Eusebio*. [J. WIL-

PERT, *Die Römischen Mosaiken, &c.*, vol. i, pp. 30 ff.]

² Suetonius, *Augustus*, 99.

of which were of a new type ; and also of two great Imperial tombs, one of which, the so-called Mausoleum of Santa Costanza, was the forerunner of the vaulted round church with an annular aisle.



Fig. 268. The Constantinian Basilica of St. Peter. Sectional view looking east
(From a seventeenth-century fresco in the crypt)

Of the latest of the great public Thermae of Rome, situated in the Sixth Region and erected by Constantine about 326,¹ there is little or nothing to be said, as the last traces above-ground have disappeared. Nor can the drawings of Palladio,²

¹ AURELIUS VICTOR, *Liber de Caesaribus*, 40. URLICH, *Codex Urbis Romae topographicus*, pp. 8, 9. JORDAN, *Topographie der Stadt Rom*, vol. ii, p. 549. NIBBY, *Roma Antica*, ii,

pp. 793-9.

² BERTOTTI, SCAMOZZI, *Le Terme dei Romani*, tavv. xiv, xv.

who saw the ruins while they were still considerable, furnish us with anything of use for our present inquiries. We will therefore pass directly to the Christian basilicas and the Imperial mausoleums.

Eusebius tells us that Constantine, after his triumphal entry into Rome, endowed the Church from his treasure and enlarged, or erected on a grand scale, its places of worship, which he, moreover, furnished.¹ The *Liber Pontificalis* or

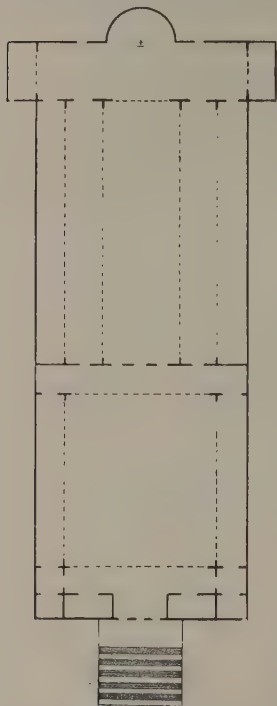


Fig. 269. Sketch-plan of the Constantinian St. Peter's

Book of the Popes records a considerable number of such buildings and gifts.² Of these churches we will select the two largest and most famous, the Lateran and Vatican Basilicas: the former, the older of the two, and the most important church of the Constantinian age, because its plan is the first example of its kind; the latter because we possess descriptions, plans, and drawings which give us accurate information about it.

THE BASILICA OF ST. JOHN LATERAN, begun in 313 in the pontificate of Miltiades (311-314), was finished under Silvester (314-335), and was called from its founder the Basilica Constantiniana. It was dedicated to Christ the Saviour, was the cathedral church of Rome, and took precedence even over St. Peter's and St. Paul's, which contained 'the trophies' or tombs of the two founders of the Church of Rome. Of these trophies we find clear mention as early as the pontificate of Zephyrinus (between 198 and 217). An adjunct to the basilica was the baptistery.³

Its plan was that of a Latin cross (*crux commissa*), the arms projecting only slightly, and it was turned towards the west. The body of the church had a nave and four aisles divided by columns, and entered by five doors. From the back wall of the transept, continuing the lines of the nave, the apse projected, semicircular on both sides originally, but the exterior was made polygonal when the ambulatory of Leo the Great was enlarged by Sergius II (844-845).⁴ I saw and studied the ambulatory before its ill-advised destruction towards the end of the last century. The basilica had a timber roof. In front was an atrium with colonnades, and beyond that a portico.⁵

We will discuss the novelty of this plan under the section about the Vatican Basilica, as it is common to both. The baptistery was rebuilt by Xystus III (432-440),⁶ and we have no description of the original one; but it may have been circular.⁷

¹ EUSEBIUS, *Life of Constantine* (ed. Heikel), i, 42.

² DUCHESNE, *Le Liber Pontificalis*, vol. i, pp. 170-87.

³ DUCHESNE, op. cit., vol. i, pp. 139, 172, 174, 191, 192. *Nuovo Bullettino di Archeologia Cristiana*, xix (1913), pp. 7-19, DE ROSSI, *Una questione sull' arco trionfale dedicato a Costantino*. EUSEBIUS, *Hist. Eccles.*, ii, 25.

⁴ DUCHESNE, op. cit., vol. ii, pp. 91, 102.

⁵ RASPONI, *De Basilica et Patriarchio Lateranensi*, pp. 33-43 and plan. ROHAULT DE FLEURY, *Le Latran au Moyen Age*, pl. iv. LAUER, *Le Palais de Latran*, pls. ii, iv.

⁶ DUCHESNE, op. cit., vol. i, pp. 234, 236.

⁷ RIVOIRA, *Lombardic Architecture*, vol. i, p. 89; *Moslem Architecture*, pp. 272, 273.

THE VATICAN BASILICA OF ST. PETER was erected in the pontificate of Silvester over the tomb of the prince of the Apostles, the founder of the Church of Rome.¹ Its orientation was towards the west (fig. 268).

The plan was that of the 'crux commissa' with widely extended arms. The body of the church consisted of a nave with four aisles separated by four rows of marble columns plundered from pagan edifices, and it was entered by five doorways. The two middle colonnades, which had to bear the great weight of the walls and timber roof, carried architraves; while the two outer ones were arcaded, and the arches, following a Campanian (not Eastern) precedent,² rested on the capitals without the interposition of an abacus. The two southern aisles

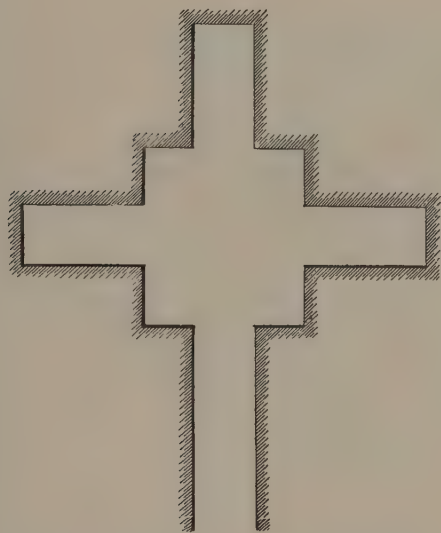


Fig. 270. Vetulonia. Plan of the Poggio alla Guardia tomb

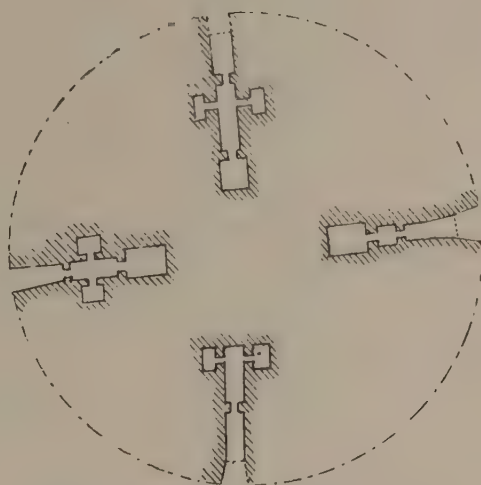


Fig. 271. Castellina in Chianti. Plan of Palaeo-Etruscan tomb

rested on the foundation of three walls of one of the long sides of the Circus of Gaius and Nero. In the back wall of the transept, and corresponding to the nave, was the semicircular apse, with a door on either side of it.

In front of the basilica was a large rectangular court enclosed by porticoes, later known as 'the Paradise', approached through a porch or vestibule to which there was an ascent by a long flight of steps, due to the different level on which the church was built. The court or 'quadriporticus' had colonnades all round. The open arcades shown in Alfarano's plan (1589-1590), which take the place of the outer walls at the two sides, are the result of later alterations. We have no information about the original form of the porch. We only know of changes made in it, e.g. the erection of a bell-tower (*turris campanaria*) by Stephen II (752-757), and the construction of a residence for the archpriest of the basilica (*palatium archipraesbiteri basilicae*), and a restoration by Gregory IV (827-844).³

¹ DUCHESNE, *op. cit.*, vol. i, pp. 176, 193-5.

² RIVOIRA, *Moslem Architecture*, pp. 70, 71.

³ DUCHESNE, *op. cit.*, vol. i, pp. 454, 460, 461, 525-9, pl. i; ii, pp. 80, 81.

So that while my sketch-plan of the Constantinian St. Peter's here appended (fig. 269) is approximately correct as a whole, with regard to this portion it is, with the exception of the triple doorway, conjectural. Equally uncertain are the form and dimensions of the original flight of steps, which in early times was enlarged by Pope Symmachus (498-514), renewed by Hadrian I (772-795), and restored by Leo III (795-816).¹

The basilica was lighted by numerous large arched windows. In the nave colonnades, the boldly projecting cornice of the marble architrave was intended for a service gallery. This was no novelty, for, long before, inside the Pantheon the two great projecting members were provided with a balustrade or rails in order to make circulation possible.

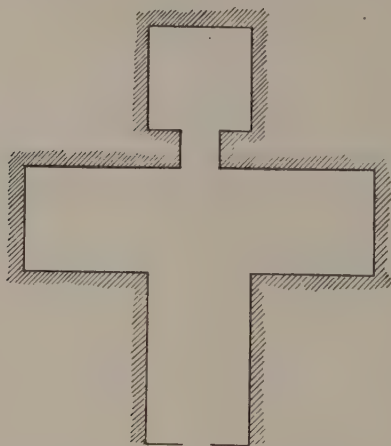


Fig. 272. Volterra. Plan of one of the Inghirami tombs

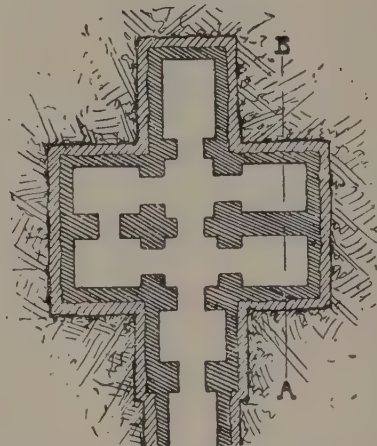


Fig. 273. Cortona. Plan of the 'Tomba di Melone' at Sodo

The walls, which were 1.45 m. (about 4 ft. 10 in.) thick, and in some parts about 1.55 m. (5 ft. 2 in.) and 1.78 (5 ft. 10 in.), were of brick and tufa; and, though the work was rough and hasty, they were solidly built. The roof was of timber, with a panelled ceiling in the nave, and very probably also in the transepts. It is true that the drawings we have of the interior of the basilica show the roof timbers as visible. But we gather from Paulinus, Bishop of Nola (353-431), that the nave had a panelled ceiling.² Moreover, Ciampini alludes to such panels, though they are not represented in his illustration (tab. viii),³ and Alfarano states that the ceilings throughout the basilica were panelled.⁴ The outer covering was of ordinary tiles. We know that upon these tiles of Corinthian bronze were placed by Pope Honorius I (625-638).⁵

The dimensions given to us of the plan of the basilica are inconsistent. Taking

¹ DUCHESNE, op. cit., vol. i, pp. 262, 267, 503, 519; ii, pp. 28, 46, 47.

² S. PAULINUS NOLANUS, *Epistola XIII*, 13. MIGNE, *Patr. lat.*, vol. lxi, cols. 214, 215.

³ *De sacrīs aedificiis a Constantino Magno constructis*, p. 33.

⁴ *Studi e testi*, n. 26, *Documenti e ricerche per la storia dell'antica Basilica Vaticana*. I, CERRATI, *Tib. Alfarani de Basilicae Vaticanae structura*, p. 13.

⁵ DUCHESNE, op. cit., vol. i, pp. 279, 280, 323, 325.

those of Alfarano,¹ whose calculations were made on the interior, we get the following. The body of the church was 63.55 × 90.54 m. (about 205 × 300 ft.), the transept 86.97 × 17.39 m. (283 × 40 ft.), the nave 23.64 m. (85 ft.) wide between the centre of the columns, the aisles 9.81 m. (33 ft.) and 9.25 m. (32 ft.) wide respectively, the apse 17.74 m. (58 ft.) wide and 9.81 m. (33 ft.) deep. For the elevation we have approximately: nave 37.91 m. (125 ft.), inner aisles 18.29 m. (60 ft.), outer aisles 13.83 m. (45 ft.), transept 37.91 m. (124 ft.), apse 22.30 m. (73 ft.). The forecourt measured 63.55 × 78.05 m. (205 × 257 ft.), not including the vestibule. Of the surrounding porticoes, which also had wooden roofs, three were 9.14 m. (30 ft.) wide, while the one next to the front of the church was 11.83 m. (36 ft.). These summary details are derived from the following authorities,



Fig. 274. Cortona. 'Tomba di Melone' at Sodo during restoration
(From a photograph by Prof. Pernier)

in addition to those already mentioned: Petrus Mallius (twelfth century),² Vegius (1407-1458),³ Panvinus (1529-1568),⁴ Alfaranus (d. 1596),⁵ Grimaldi (1623),⁶ Nardini (d. 1661),⁷ Ciampini (1633-1698),⁸ Severano (seventeenth century),⁹ Bonanni (1638-1725),¹⁰ Ugonio (sixteenth century),¹¹ De Rossi (1822-1894),¹² Duchesne (1843-1922),¹³ and Marucchi.¹⁴

¹ *Studi e testi*, op. cit., pp. xxxiv, xxxv, 6-9.

² *Acta Sanctorum*, June, vol. vii, pp. 37-56, *Historia basilicae antiquae S. Petri in Vaticano*.

³ *Ibid.*, pp. 61-85, *De rebus antiquis memorabilibus Basilicae S. Petri Romae*.

⁴ *Spicilegium Romanum*, vol. ix, pp. 203-382, *De rebus antiquis memorabilibus, et praestantia Basilicae S. Petri*.

⁵ *Studi e testi*, n. 26, CERRATI, op. cit., pp. 3-145.

⁶ *Capitular Archives of the Vatican Basilica, Veteris Vaticanae Basilicae Diagrammatum*, tavv. 4, 6.

⁷ *Roma antica*, vol. iii, pp. 355-62.

⁸ *De sacris aedificiis a Constantino Magno constructis*, pp. 27-109, tab. viii, ix.

⁹ *Memorie sacre delle sette chiese di Roma* (1675), vol. i, pp. 1-267.

¹⁰ *Numismata Summorum Pontificum Templi Vaticani fabricam indicantia*, pp. 9-17, tavv. 2-6.

¹¹ *Historia delle Stazioni di Roma* (1588), 85-104.

¹² *Inscriptiones Christianae Urbis Romae*, vol. ii, pp. 229-34, and pl. p. 229.

¹³ *Le Liber Pontificalis*, vol. i, pp. 525-9, pl. i, p. 192.

¹⁴ *Nuovo Bullettino di Archeologia Cristiana*, vol. xi (1905), pp. 135-79, 269-72, MARUCCHI, *La crocifissione di San Pietro nel Vaticano*.

The two basilicas which we are now considering are specially remarkable for two new features, one of them being of capital importance in the history of church architecture.

I. The first of these is the orientation to the west. This direction, demanded by the liturgy, was the rule for the new basilicas erected by the first Christian Emperor at Rome, and recorded in the *Liber Pontificalis*.¹ Besides these it was certainly found in the basilica of St. Paul on the road to Ostia, rebuilt in a much larger and more splendid form by the Emperors Valentinian II (383-392) and Theodosius I (379-395), and finished by Honorius (393-423);² and also in that of St. Laurence on the Via Tiburtina, of modest dimensions, and afterwards rebuilt by Pope Pelagius II (579-590).³ The basilica of St. Agnes on the Via Nomentana, erected above the original tomb of the saint, was set towards the south-east owing to the lie of the ground at this point.⁴ We have no evidence

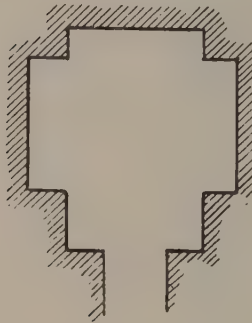


Fig. 275

Plan of tomb of Atta
near Rome

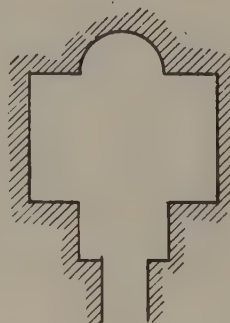


Fig. 276

Plan of tomb of the Plautii
near Rome

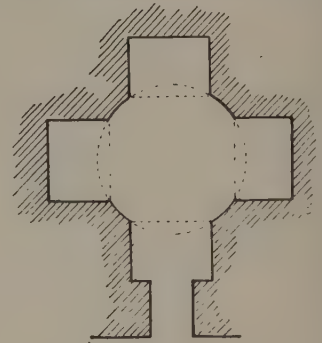


Fig. 277

Cassino. Plan of tomb known as
the 'Cappella del Crocefisso'

as to the orientation of the church of SS. Peter and Marcellinus on the Via Labicana.

On the other hand, the basilica of Santa Croce in Gerusalemme⁵ was an adaptation of a great hall in the Sessorian palace, and the eastern orientation of its apse was unavoidable.⁶ It was the Church of Ravenna which afterwards changed the orientation of churches to the east, and made it a fixed rule.⁷

II. The basilica of cruciform plan. Derived from the principal instrument of the Passion and from the Labarum of Constantine, this was the architectural expression of the symbol under whose aegis the victory which gave freedom to the Christians was gained, of which victory those who planned and erected the new basilicas had immediate and tangible proofs. At the same time it is connected with the Basilica Nova with its longitudinal aisles and their outer walls, its terminal apse, and its one-storied plan. These novel arrangements were

¹ DUCHESNE, *Lib. Pont.*, vol. i, pp. 170-87.

² DUCHESNE, *ibid.*, pp. 178, 195. NICOLAI, *Della Basilica di S. Paolo*, pp. 2-7.

³ DUCHESNE, *Lib. Pont.*, vol. i, pp. 181, 197, 198, 309, 310.

⁴ ARMELLINI, *Il Cimitero di S. Agnese sulla Via Nomentana*, p. 15.

⁵ DUCHESNE, *Lib. Pont.*, vol. i, pp. 179, 196.

⁶ LANCIANI, *Ruins and Excavations*, pp. 399, 400.

⁷ RIVOIRA, *Lombardic Architecture*, vol. i, p. 8. *Atti della Pontificia Accademia Romana di Archeologia*, ser. ii, vol. xiii, pp. 181-91, RIVOIRA, *La Chiesa del Santo Sepolcro in Gerusalemme*.

completed by attaching to the front of the building the peristyle and vestibule of the Roman 'domus' or house. The general effect of the new sacred basilicas was so striking, both from the area occupied and from their imposing form, that they rivalled the civil basilicas of the Roman Forum. Neither East nor West had ever seen a building of this type; a type which in the future, modified in sundry ways, was to have such an important influence in religious architecture.

At this point I may say a few words about the cruciform plan, whether embodying the 'crux immissa' or 'Latin cross' with unequal arms, or the square one with equal arms, erroneously described as the 'Greek cross'. I have already discussed the matter elsewhere.¹

From a very early period the Etruscans, as well as other peoples of the Mediterranean basin,² sometimes built the sepulchral chambers in their barrows in the form of a cross. At Vetulonia in the Poggio alla Guardia tomb (eighth-seventh century B.C.),³ the mortuary chamber, now re-erected in the garden of the Archaeological Museum at Florence, is in the form of a cross with double angles and a long stem (fig. 270). In the great tumulus at Castellina in Chianti (fig. 271), three of the four Palaeo-Etruscan vaults (ascribed to the seventh century B.C.)⁴ which it contains are cruciform. They continued to be made down to a much later date.⁵

The Etruscans also gave a cruciform shape, either simple or complex, to some of their underground tombs; for instance, one of the Inghirami tombs at Volterra of the second or third century B.C. (fig. 272), the 'Tomba del Colle' and the 'Tomba della Scimia' (Poggio Renzo) at Chiusi, the vault of the Rufia family near Perugia (third century B.C.),⁶ the 'Tomba di Melone' at Sodo near Cortona, the sepulchre of Saturnia which has come to light at the spot known as 'le Sparne', and the above-mentioned Poggio alla Guardia tomb at Vetulonia. Sometimes the cross had two transverse limbs, as in the aforesaid 'Tomba di Melone' (figs. 273, 274).

The Etruscan cruciform plan was inherited by the Romans, and was by them reduced to definite and fixed shapes. We find it first in a simple form, with equal or unequal arms, in the sepulchral chamber of tombs with a tumulus of earth or masonry (figs. 275, 276). In process of time it passed to the Columbaria, as is shown by that, mentioned above (p. 28), of the freedmen of the Empress Livia, which is 9.37 m. (about 30 ft.) square. It also appears in the Catacombs.⁷

Later it was applied to tombs without a tumulus, which were given a cross form (either only internally, or externally as well) in the greatest imaginable variety. Any one who turns over the pages of Montano⁸ and Bramantino⁹

¹ RIVOIRA, *Lombardic Architecture*, vol. i, p. 28; *Moslem Architecture*, pp. 259-61.

² *Atti del Congresso Internazionale di Scienze storiche*, Rome, 1903, vol. v, pp. 377-480, PINZA, *Le origini di alcuni tipi dell'architettura sepolcrale tirrena nella età del ferro*.

³ MILANI, *Museo Arch. di Firenze*, vol. i, pp. 283, 284.

⁴ *Notizie degli scavi*, vol. xiii (1916), pp. 263-81, PERNIER, *Castellina in Chianti*.

⁵ *Notizie degli scavi*, vol. xii (1915), pp. 347-87, fig. 1, MENGARELLI, NOGARA, *Cervetri, Nuove*

esplorazioni nella necropoli di Caere, &c.

⁶ *Bollettino della R. Deputazione di Storia patria per l'Umbria*, vol. xvii, pp. 123-94, BELLUCCI, *Ipogeo etrusco presso Perugia*.

⁷ DE ROSSI, *Roma Sotterranea Cristiana*, vol. iii, p. 473, tavv. xlii-xlv.

⁸ *Scielta de varii tempieetti antichi*, tavv. 5, 22, 27, 39, 40, 42; *Raccolta de tempiee*, &c., tavv. 4, 6, 16, 18, 19, 28, 31, 34, 44, 45, 49.

⁹ MONGERI, *Le rovine di Roma*, tavv. xviii, xxxi, xxxii, xli, xliii, lxiii, lxiv, lxxv, lxxviii.

(fifteenth–sixteenth centuries) may satisfy himself of the truth of my statement. In addition I may mention the plan of a well-known and interesting tomb of the good Imperial Age at Cassino, which goes by the name of the Cappella del Crocifisso. It is built of large blocks of stone carefully cut, and laid without mortar. The chamber inside is covered by a cupola which is lighted by four small windows



Fig. 278. Mausoleum of St. Helena near Rome. Exterior

and is set on the curvilinear angles and the hollows of the four arches from which the four arms of the cross open (fig. 277).

Lastly it passed to the churches of Rome, and thence it travelled to the East, where the basilica of the Holy Apostles erected by Constantine in 'New Rome' ¹ forms the earliest instance. This church was rebuilt in a more splendid form by Justinian between 536 and 550, and was known as the 'Apostoleion'. ²

¹ EUSEBIUS, *Life of Constantine* (ed. Heikel), iv, 58, 59, 60.

² *Civiltà Cattolica*, 1915, vol. 4, pp. 147, 422 ;

1916, vol. 1, p. 24, BRICARELLI, *S. Marco di Venezia e l' 'Apostoleion' di Costantinopoli*.

On taking leave of the Constantinian basilicas I may mention that of St. Sebastian 'in Catacumbas' on the Via Appia Antica, originally the 'basilica Apostolorum'. At first it consisted of a nave and aisles separated by stout piers 1.50×1 m. (4 ft. 10 in. $\times$ 3 ft. 3 in.) terminating in an ambulatory pierced by arches, the earliest instance in an actual building of this arrangement.¹ The surviving walls, which are of concrete, are faced with alternate courses of brick and small blocks



Fig. 279. Mausoleum of St. Helena. Interior

of tufa, differing but little in their regularity from those of the neighbouring cloister-court of the Mausoleum of Romulus and the Circus connected with it, so that they seem to be of the same date. They certainly cannot be ascribed to the time of Hadrian I (772-795) ('ecclesiam Apostolorum foris porta Appia . . . ruinis praeventam, noviter restauravit'²), considering that by the seventh century wall-facing of this sort owing to the poverty of the age had sunk to the lowest depths, and remembering that in the phraseology of the *Liber Pontificalis* the words 'noviter restauravit' have not the meaning of rebuilding but of restoration on a considerable scale. So the work of Pope Hadrian must have consisted of important restorations.

¹ RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 29, 30.

² DUCHESNE, *Lib. Pont.*, vol. i, p. 508.

The walls give the impression of being as old as the pontificate of Silvester (314–335), or may be of Damasus (366–384),¹ for we must bear in mind that work of this kind remained almost stationary, so far as technique was concerned, during the fourth century, differing only in the employment of re-used bricks as we get farther from the time of Maxentius.

And now let us turn to the Imperial Mausoleums.

THE MAUSOLEUM OF ST. HELENA was built by Constantine for his mother (d. 304–305) close by the cemetery of SS. Peter and Marcellinus, 'ad duas lauros' on the Via Labicana, in the grounds of a suburban Imperial villa. It is popularly known as 'Tor Pignattara' (figs. 278, 279).

It was near the basilica erected by Constantine over the tomb of these martyrs, and called after them.² Of this there are no longer any remains visible. The small cruciform building (fig. 280) with cross-vaulted roof, the walls of which still existed to the height of a metre when Bosio (d. 1629) saw it (fig. 281), and which was believed to be the church of St. Tiburtius, is now thought to have been the basilica in question.³ But in all probability the church of SS. Peter and Marcellinus was of basilica form, with a wooden roof after the Constantinian fashion. In fact, Hadrian I renewed the roof,⁴ whereas the other cruciform building, being entirely composed of solid materials, and having its roof of flat tiles immediately above the vaulting (the idea of covering a vault with a wooden roof being quite unknown in the time of the first Christian emperor), would not have needed such attention from the Pope.

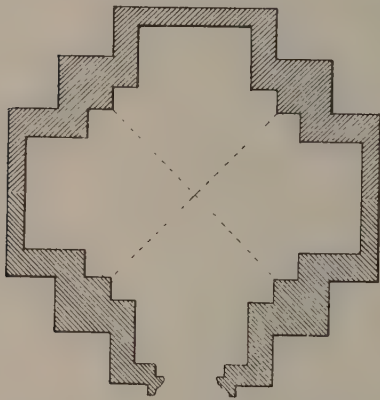


Fig. 280. Plan of supposed church of SS. Peter and Marcellinus

The imposing remains of the Mausoleum of St. Helena, little changed since the days of Bosio (fig. 282) and Piranesi,⁵ when time, rather than destructive human agency, had largely done its work, make it possible to give the following description of the building.

The plan is circular, with an internal diameter of over 19 m. (about 62 ft.). According to Bosio it stood in the middle of a large court surrounded by porticoes. On the inner face of the lower part of the circumference wall, which is 3.80 m. (about 12 ft.) thick, there open on the octagonal axes four large rectangular recesses, and four curvilinear ones on the diagonals, just as in the Mausoleum of Romulus, son of Maxentius. In the one facing the entrance was placed the magnificent porphyry sarcophagus measuring 2.55 × 1.70 m. (8 ft. 3 in. × 5 ft. 7 in.), now in the Vatican Museum (Hall of the Greek Cross) (fig. 283).

¹ *Nuovo Bull. di Arch. Crist.*, xxiii (1917), pp. 76–87, MARUCCHI, *Ulteriore studio sulla Memoria Apostolica presso le Catacombe della Via Appia*.

² DUCHESNE, *Lib. Pont.*, vol. i, pp. 182, 198, 199. BOSIO, *Roma Sotterranea*, pp. 313–19, 321–5. *Nuovo Bull. di Arch. Crist.*, vol. iv (1898),

pp. 137–93, MARUCCHI, *La cripta storica dei ss. Pietro e Marcellino*. EUSEBIUS, *Life of Constantine*, iii, 47.

³ DUCHESNE, *Lib. Pont.*, vol. i, pp. 198, 199.

⁴ DUCHESNE, *ibid.*, pp. 500, 501, 517.

⁵ *Le antichità Romane*, vol. iii, tavv. xvi–xviii.

It appears that this receptacle contained not only the body of the empress but also the remains of her husband Constantius I Chlorus, the friend of the Christians, who died at York in 306. And even if it did not contain both bodies, owing to the fact that he remained a pagan, yet the monument was designed with that intention by the foundress, as is shown by the two projecting busts, each accompanied by a tablet, which are repeated on the other long face, and



Fig. 281. Church of St. Tiburtius
(From BOSIO, *Roma sotterranea*)

also by the military scenes, referring, in all probability, to the emperor's campaigns against the barbarians and his reconquest of Britain.

On the evidence of a drawing published in Bosio's posthumous work,¹ it has been stated that the reliefs on the sarcophagus have been very extensively restored, and that in particular the heads are for the most part quite new.² I reproduce the poor engraving (fig. 284), faithfully copied by Aringhi,³ and with some variation by Ciampini,⁴ so that any one may compare it with a photograph of the

¹ *Roma sotterranea* (Rome, 1632), p. 317.

² *Mélanges d'archéologie et d'histoire*, vol. xxxvi (1916-17), pp. 205-61, FRANCHI DE' CAVALLIERI, *I funerali ed il sepolcro di Costantino*

Magno.

³ *Roma subterranea novissima*, vol. ii, p. 41.

⁴ *De sacris aedificiis, &c.*, p. 123, tab. xxviii.

original reliefs, and satisfy himself that the plate was engraved in a free manner from a rough and inaccurate sketch. It is incredible that, under the eyes of such a connoisseur and antiquary as Pope Pius VI (Braschi, 1775-1800), surrounded as he was by competent archaeologists, a barefaced travesty of the famous sarcophagus can have been perpetrated in carrying out the repairs which he ordered. In fact, any one who makes a careful examination of the work, and especially of the grain and quality of the porphyry, will be convinced that as a whole it is in its original state, with the exception of the band forming the plinth, and the lining of travertine inside. In the ancient parts, by far the most numerous, the grain of the porphyry

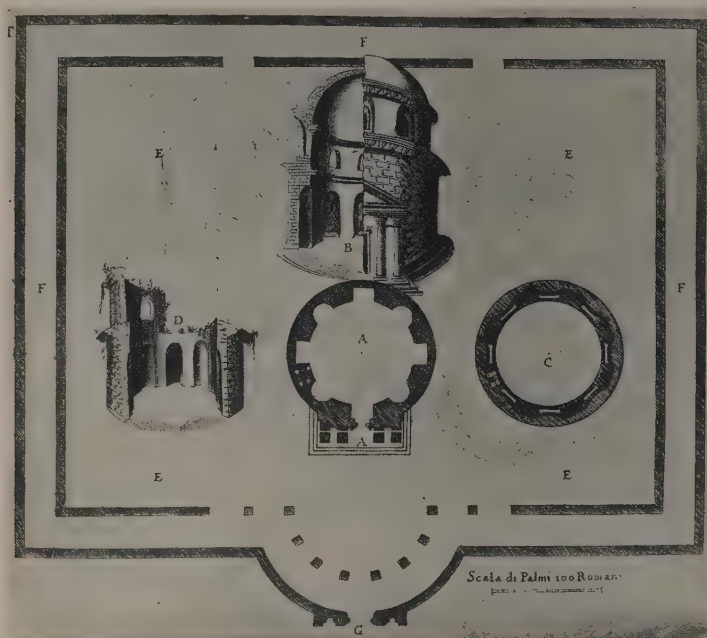


Fig. 282. Mausoleum of St. Helena
(From Bosio, *Roma sotterranea*)

is different and better marked than in those which are the result of restorations, just as the quality of the execution of the carving is different. The process of restoration which it has undergone (and it had had a previous one following the injuries which it had suffered on two occasions after it had been moved to the Lateran ¹) was obviously as follows. It was taken to pieces; the base and internal lining were made afresh; the whole was cleaned and polished; the sculptures where missing or damaged were restored. The last was a long and difficult process, considering the hardness and the formation of the marble, requiring the employment of a tool or chisel ('la martellina') specially tempered for use on hard stones. Finally, the monument was put together again, and the result, it must be allowed, is very successful.

In front of the sarcophagus of St. Helena stood an altar of silver.

¹ LANCIANI, *Storia degli scavi*, vol. i, p. 7. Bosio, op. cit., p. 317.



Fig. 283. Porphyry Sarcophagus of St. Helena. (Vatican Museum of Sculpture)

To the left of the central recess a staircase leading to the upper story is taken out of the thickness of the wall. The idea of making stairs in the thickness of a wall is of great antiquity, being found in the nuraghi architecture of Sardinia.¹

Boldly set back from the base or plinth of the structure rises the wall or drum of the cupola. The exterior has a series of great curvilinear recesses corresponding to the internal niches below, each containing a large window, designed both to relieve the niches by discharging on to the solid wall between them, and thence to the base, part of the weight of the drum and the dome, and also to give light to the interior.



Fig. 284. Sarcophagus of St. Helena. (From BOSIO, *Roma sotterranea*)

The dome, which is of concrete, and stepped all the way round outside, was lightened by rings of inverted jars, those in the haunches being duplicated. I do not know on what evidence Isabelle based his statement that the dome was covered by a wooden roof.² This practice came into use when, towards the close of the fifth century, light domes and half-domes were being built of small worked materials or hollow tubes, as against the older heavy ones of concrete.

The walls are faced with courses of narrow bricks between thick beds of mortar.

Attention may be directed to two original characteristics of this sepulchral edifice.

(1) The external recesses of the drum pierced by windows. They are derived from the connecting external recesses which we noticed in the Baths of Caracalla (p. 172), and are the earliest dated example of this feature, which appears again in the tomb of the Turcii at Tivoli, popularly known as the 'Tempio della Tosse',

¹ R. Accademia dei Lincei, *Monumenti Antichi*, vol. xxiii, p. 346, A. TARAMELLI; *Il tempio*

nuragico.

² ISABELLE, *Les édifices circulaires*, p. 69.



Fig. 285. Tivoli. Tomb of the Turcii, known as the 'Tempio della Tosse'
(From PIRANESI, *Vedute di Roma*, vol. ii)

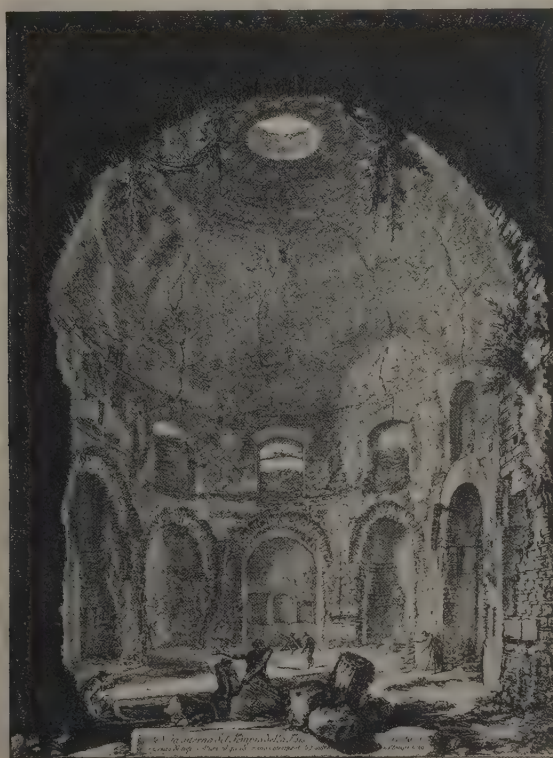


Fig. 286. Interior of the 'Tempio della Tosse'
(From PIRANESI)

and shown by the alternate brick and stone courses of its walls to belong to the fourth century (figs. 285, 286). In all probability it was built, as Canina¹ thought, in the reign of Constantius II (337-361) by L. Turcius Apronianus, Prefect of



Fig. 287. The arch of Malborghetto

Rome in 339.² In this tomb we may note the use in the dome of meridian ribs confined to the overhanging or upper part, where the weight of the masonry was most to be feared, and where the thrust was no longer counteracted by the

¹ CANINA, *Edifici*, vol. v, pp. 112, 113; vi, tav. cxxiii.

² COMPARETTI, *Museo Italiano di antichità*

classica, vol. iii, p. 481, TOMASSETTI, *Note sui Prefetti di Roma*.

part of the drum which rose above the spring of the dome. This simplification shows an advance as compared with the hemispherical vault of Santa Costanza, and the tomb is therefore later in date.

One of Montano's illustrations shows the use of this feature in the interior of a tomb on the Via Praenestina.¹

(2) The use of concentric rings of pottery jars (amphorae) in the dome. We have already noticed an example of this in the octagonal bathroom of the Villa of the Gordians. But in the tomb of Helena it is extended to the whole of the dome. It was some device of this kind which led the builders of Ravenna to use spirals of terra-cotta tubes in the construction of spherical vaults.²

The Mausoleum of the Empress Helena has points of connexion: for its lower stage with the Imperial tomb of the Gordians (from which its plan and the number of niches inside is derived), and with that of Romulus, son of Maxentius; and for the upper part with the Licinian rotunda, where the great advance had



Fig. 288. Brickwork of the arch of Malborghetto

already taken place. But it shows, both in construction and stability, progress beyond the latter in the simplification obtained by the use of curved recesses in the drum and hollow materials in the dome.

In the Rome of the Emperors this was the last Imperial tomb with a simple circumference wall. The two circular structures of the 'Mausoleum Augustorum' at the Vatican were erected under the Lower Empire after Roman models. It must have been built soon after Constantine became master of Rome,³ when the empress-devotee was already well on in years.

To the same age must belong the four-fronted arch of Malborghetto at the seventeenth kilometre on the Via Flaminia near Rome, perhaps a memorial of the victory 'ad Saxa Rubra'.⁴ Its date is shown by the construction (fig. 287). Giuliano da Sangallo has left a record of it.⁵ It is of rectangular plan, and its internal dimensions are about 10.60 × 6 m. (about 35 × 20 ft.). The walls, with a base of squared stone blocks, consist of narrow bricks with wide mortar joints (fig. 288). There are bonding courses of large tiles between every thirteen to

¹ MONTANO, *Raccolta de tempj*, &c., tav. 38.

² RIVOIRA, *Lombardic Architecture*, vol. i, pp. 18 ff.

³ RIVOIRA, *ibid.*, vol. ii, pp. 22-4.

⁴ [So also F. TÖBELMANN, *Der Bogen von*

Malborghetto (2 *Abh. d. Heidelberger Akad. d. Wiss.*, 1915), reviewed in *The Journal of Roman Studies*, x (1920), p. 201.]

⁵ HUELSEN, *Il libro di Giuliano da Sangallo*, fol. 36, p. 53.

forty-four courses. The arches have double rings, and at their imposts there is a band of oblong blocks of stone. There are scanty remains of the marble architrave. As the interior space is elongated, the cross-vault with its three-chain ribs which forms the roof is set between two pieces of barrel-vaulting (fig. 289).

THE MAUSOLEUM OF SANTA COSTANZA is said by the Bollandists to be the tomb of Constantia, daughter of Constantine,¹ of whose existence there is no record in history. In Ammianus Marcellinus we read that the body of Helena (d. 360), wife of Julian (361-363), was sent to Rome and buried beside that of her sister Constantina (d. 354), wife of Gallus Caesar (351-354), near the Via Nomentana.² We learn from the Liber Pontificalis that as early as the time of Nicholas I (858-867) the building was known as the Church of St. Constantia.³

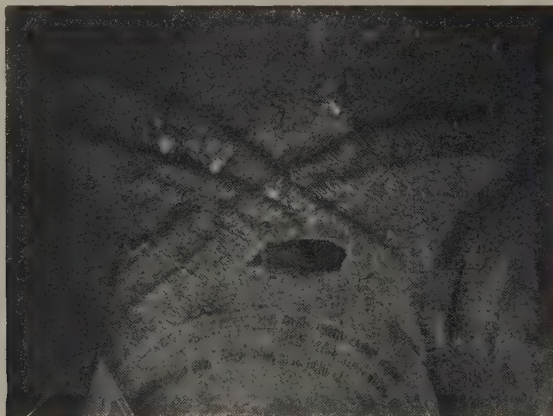


Fig. 289. Vault of the Arch of Malborghetto

This celebrated edifice has been the subject of various theories. One is that it was the baptistery belonging to Sant' Agnese, mentioned in the Liber Pontificalis, and adapted for the purpose of a tomb as well; another that it is the baptistery, later converted into the mausoleum of Santa Costanza; or (conversely) the tomb of Constantina, erected by Gallus Caesar, and afterwards made into a baptistery; or, again, the mausoleum of the ladies of Imperial rank in the family of Constantine, which, to begin with, may also have been intended for use as a baptistery.⁴

My view, on the other hand, is that it was erected originally as the burial place of Constantine himself, and between the years 324 and 326; and that afterwards it became the mausoleum of the ladies of the Imperial family, receiving first of all the body of the emperor's favourite sister, Constantia, whose name, with good reason, it still bears. We may dismiss the idea that, at this date, its founder meant it for a baptistery combined with a tomb, a conception contrary to the principles of the age.

¹ *Acta Sanctorum*, January (21), vol. ii, pp. 353, 354; February (18), vol. iii, pp. 67-71.

² AMMIANUS MARCELLINUS, xxi, 1, 5.

³ DUCHESNE, *Lib. Pont.*, vol. ii, p. 163.

⁴ ISABELLE, *Les édifices circulaires*, pp. 79-85,

pls. xxxiii-xxxvii. GARRUCCI, *Storia dell' arte cristiana*, vol. iv, tavv. cciv-ccvii. DE ROSSI, *Musaici*, &c.; *Musaici del Mausoleo appellato di S. Costanza*. GRISAR, *Roma alla fine del Mondo antico*, pp. 380-3.

The baptistry of Sant' Agnese was a small affair, proportioned to the limited dimensions of the basilica to which it was attached. It was not an imposing building, such as the rotunda with which we are dealing.

You have only to look at the dimensions of the Lateran Baptistry—19.30 m. (about 63 ft.) between any two opposite faces on the inside—and the reasonableness of my view will be apparent. It was built by Xystus III (432–440)¹ in place of Constantine's earlier one, which must have covered a smaller area, otherwise it would not have been so soon rebuilt.

The baptistry of Sant' Agnese probably disappeared when Honorius I (625–638) rebuilt the basilica,² and apparently erected the enclosure wall of the cemetery



Fig. 290. Remains of the wall round the cemetery of Sant' Agnese fuori le mura

in front of the Mausoleum (fig. 290). This wall is of very coarse work, formed of irregular alternate courses of small tufa blocks and re-used bricks, with wide mortar-joints. Its date is later than the pontificate of Pelagius II (579–590), when this kind of work was becoming decadent, as I remarked when dealing with Hadrian's Villa at Tivoli, but was not so rude as it is in the wall in question. Therefore Armellini (1852–1896) was wrong in placing it in the time of Constantine or some of the more distinguished members of his family.³ In that age the brick-kilns were still at work, and builders had not yet to fall back on what bricks were left in them, and on those which came from the destruction of older buildings.

On the occasion of the works undertaken by Honorius I the mausoleum may have been set apart for a baptistry, and this would explain the presence of a water-tank which De Rossi discovered in the central area.⁴

¹ DUCHESNE, *Lib. Pont.*, vol. i, pp. 234, 236.

² DUCHESNE, *ibid.*, vol. i, pp. 323, 325.

³ ARMELLINI, *Il Cimitero di S. Agnese sulla Via Nomentana*, p. 7.

⁴ [ARMELLINI (*Chiese di Roma*, p. 861) and WILPERT (*Römischen Mosaiken*, vol. i, p. 276) thought that the remains were those of a lime-kiln.]

After these preliminaries let us pass to the examination of the building, and to the proof of my theory as to its purpose and date. This proof depends on a series of logical, solid arguments, and of facts.

Constantine's rotunda is of annular plan, formed by a circle of columns in pairs, enclosed by a wall (figs. 291, 292). In the internal face of this wall, which is 3.20 m. (over 10 ft.) thick, four large arched niches are recessed at the octagonal axes, producing a cruciform effect. Two of them are rectangular, 3.80 m. (12½ ft.) wide, facing from north-east to south-west. In the one that looks towards the east, which is 2.30 m. (7½ ft.) in depth, was placed the porphyry sarcophagus



Fig. 291. Interior of Santa Costanza

known as that of Santa Costanza, or of Constantina, which we will discuss presently. In the opposite niche is the doorway. The two other niches are curvilinear and 3.20 m. (about 10 ft.) wide.

At the height of 1.10 m. (3 ft. 7 in.) from the floor runs a series of eleven smaller niches of both curvilinear and rectangular form, 2.10 m. (6 ft. 10 in.) in width, recessed in groups of three in the unbroken sections of the wall. But in that to the left of the door there are only two, differing from the other three sections, on account of the spiral staircase which leads to the roof of the annular aisle. The staircase, together with the turret in which it ends, is original, but the entrance is the result of an alteration in order to give access to the Catacomb of Sant' Agnese below. To these eleven niches some (e.g. Ciampini,¹ Piranesi,² and

¹ *De sacris aedificiis*, pp. 130-7.

² *Le antichità Romane*, vol. ii, tav. xxi.

De Rossi¹) have assigned statues of the apostles, reckoning them as twelve. But apparently they held a set of marble candelabra, five of which are still in existence : four in the Vatican (Museo Pio-Clementino), and one in the Basilica of Sant' Agnese. Mr. Rushforth has brought some fresh light to bear on the use of such objects in connexion with tombs.²

The diameter from wall to wall is 22.30 m. (about 72 ft.) or nearly that of the Mausoleum of Romulus, son of Maxentius, which is about 22.50 m. (about 73 ft.). The arcade of the interior has twenty-four columns in twelve pairs radiating from the centre, and corresponding to the thickness of the drum, which carry the twelve arches (the number of the apostles) on which the dome rests (fig. 293). The four arches at the cardinal points, opposite the four great niches, are larger than the other eight, thus accentuating the cruciform effect which we have already noticed. In this respect the plan recently published by Wilpert,³ taken from Dehio von Bezold's work,⁴ is incorrect. The columns, which with their bases are of alien origin and of varying circumference and height, are of grey granite. But four are of black and white granite (known as 'granito del Foro Romano') and four of red, and these last are placed opposite to the entrance and in front of the recess intended to contain the founder's sarcophagus, in order to distinguish it by the use of more valuable materials. The capitals are also re-used, and do not always exactly fit the shafts they surmount. The majority are composite, but a few are Corinthian. Some are fine work, and others of mediocre or poor execution. Their dates range from the reign of Titus to that of Maxentius. The broken architraves or cushions on which the arches are turned were made for their places.

High up in the drum, which is 1.50 m. (5 ft.) thick and has a diameter of 11.15 m. (36 ft.), begins the hemispherical dome, 19.20 m. (63 ft.) high at the apex, constructed of concrete with brick meridian ribs meeting in a keystone ring (originally open in order to light the mosaics from the top, and afterwards closed and surmounted by a cross), and bonded at intervals with courses of large tiles (fig. 294). The outer roof was of tiles, probably bronze, resting directly on the extrados ; a fact which I ascertained while a restoration of the present roof was going on. It certainly never had the pointed wooden roof given to it by Desgodetz (1653-1728),⁵

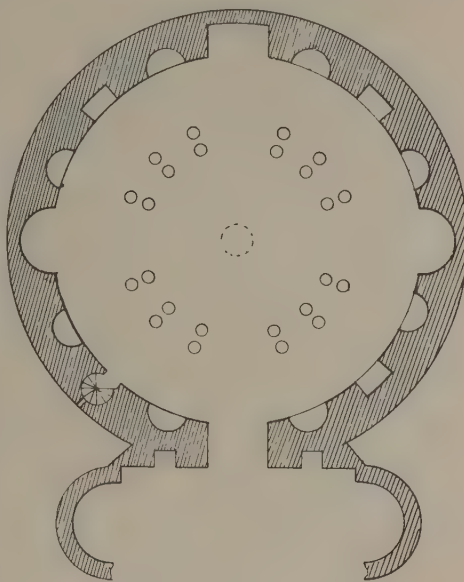


Fig. 292. Plan of Santa Costanza

¹ *Musaici cristiani. Musaici del Mausoleo appellato di Santa Costanza.*

² *The Journal of Roman Studies*, vol. v (1915), pp. 149-64. RUSHFORTH, *Funeral Lights in Roman Sepulchral Monuments* (esp. p. 153).

³ *Die Römischen Mosaiken und Malereien der*

kirchlichen Bauten vom IV bis XIII Jahrhundert, vol. i, pp. 272-321, fig. 80.

⁴ *Die kirchliche Baukunst des Abendlandes*, vol. i, taf. 8.

⁵ *Les édifices antiques de Rome*, pp. 66, 67.

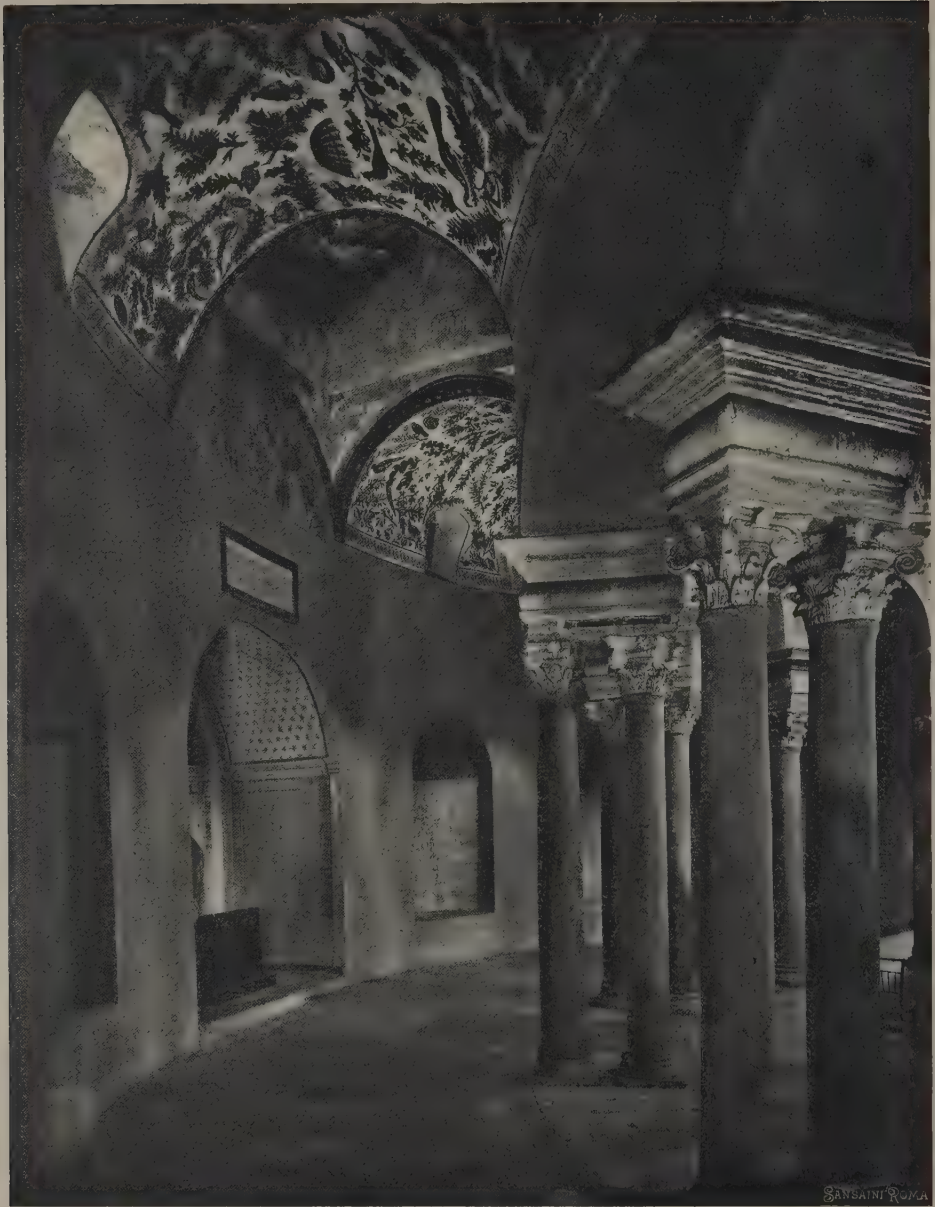


Fig. 293. S. Costanza. Part of the arcade, annular vault, and one of the large niches

and (borrowing from him) by Valadier (1762-1839) and Canina.¹ The drum is pierced by twelve large arched windows, the construction of which is original and not the result of alteration, as has been suggested (fig. 295).

¹ *Supplemento all' opera sugli edifizii antichi di Roma dell' architetto Desgodetz*, tav. iv, 9.

The drum is buttressed, and the thrust of the dome partly neutralized, by the barrel-vault of the annular aisle enclosing the central space, which is continuous, being interrupted only by the tower-like superstructure in front of the sepulchral recess, to which attention is thereby called (fig. 296). Beneath this structure stood the altar consecrated by Pope Alexander IV in 1256, which Marangoni (d. 1753) wrongly places in the centre of the rotunda.¹ Apparently the original intention was to set a silver altar here, as in the tomb of Constantine's mother.²

The doorway into the building, with a lunette and relieving arch above it, was approached through a vaulted narthex with an apse at either end, the half-domes of which are strengthened by ribs. In the present state of the building it is impossible to say how the front of this vestibule was treated; but Serlio finishes it with four columns,³ while Giuliano da Sangallo closes it with a wall containing an outer doorway.⁴

The vestibule or narthex with an apse at either end, a characteristic Roman feature, was derived from the 'dromos' of tombs like that known as 'la Pietrera' at Vetulonia; or of the one at Praesos in Crete (fig. 193), altered in the first or second century B.C., and perhaps of the Mycenaean age;⁵ or, again, of a Mycenaean tomb at Syracuse, consisting of a chamber with 'tholos' vault, reached through a small elliptical antechamber and a rectangular open porch.⁶ It has been traced back ultimately to Egypt.⁷

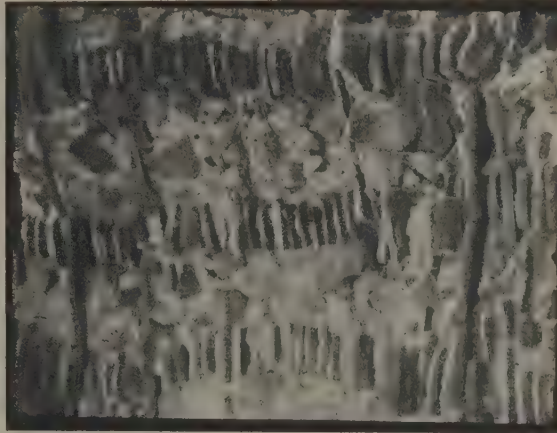


Fig. 294. Detail of the ribs in the dome of S. Costanza

The wall-facing, with its courses of narrow bricks and thick mortar-joints, recalls that of the Mausoleum of St. Helena.

The surviving mosaics only faintly recall what the original decoration of the interior was like. As late as 1450 its beauty was such that Ruccellai describes it as the fairest and most pleasing thing 'not only in Rome but in all the world'.⁸ Those who want to gain a general idea of it, without going through all the labour of my researches, should read De Rossi's account.⁹ The face of the circumference wall, the niches, the barrel-vaults, the vault above the altar, the intrados of the arches, the drum, the cupola, were all clothed with mosaics of the most elaborate kind, with scenes of sacred history, architectural designs, representations of wild

¹ MARANGONI, *Delle Cose gentilesche*, &c., pp. 299, 300. DE ROSSI, *Mosaici cristiani, Mosaici del Mausoleo appellato di Santa Costanza*.

² DUCHESNE, *Lib. Pont.*, vol. i, p. 182.

³ G. D. SCAMOZZI, *Tutte l'opere d'architettura di Sebastiano Serlio*, fols. 56-8.

⁴ HUELSEN, *Il libro di Giuliano da Sangallo*, p. 27, fol. 16.

⁵ *The Annual of the British School at Athens*, vol. viii (1901-2), p. 240, BOSANQUET, *Excavations at Praesos*.

⁶ R. Accademia dei Lincei, *Monumenti antichi*, vol. ii, pp. 6-35, ORSI, *Necropoli Sicula presso Siracusa*, Sepolcro IX.

⁷ Op. cit., vol. xiv, cols. 664-6, SAVIGNONI, *Scavi e scoperte nella necropoli di Phaestos*.

⁸ Archivio della Soc. Rom. di Storia Patria, vol. iv, pp. 563-80, *Il Giubileo dell'anno 1450 secondo una Relazione di Giovanni Ruccellai*.

⁹ *Mosaici cristiani, Mosaici del Mausoleo appellato di Santa Costanza*. [WILPERT, *Die Römischen Mosaiken*, vol. i, pp. 284 ff.]

animals, fishes, and birds of various kinds, winged boys, boats, crosses, rosettes, cruciform compartments, stars, reticulations or interlacings of circles, medallions, foliage, fruit, flowers, &c. The pavement, moreover, in the time of Serlio,¹ was still rich with marbles and mosaics.

The mausoleum of Constantine marks a new era in the evolution of vaulted circular buildings; and it may well be called the 'swan's song' of Roman Imperial structures of the kind. At an earlier period Greece could show buildings with an uninterrupted circular outline and an internal colonnade intended to help in supporting the roof (usually of conical form), as, for instance, the Tholos of



Fig. 295. S. Costanza. Exterior

Epidaurus.² But, so far as I know, there were none with a central dome and annular vault constructed entirely of masonry.

In the same way, broken architraves set on pairs of columns had been employed to carry arches; for instance, in the *Thermae* of Titus and of Trajan. But this form of support had not previously been used to carry a circular mass of such extent and weight.³

It is closely connected with the tomb of St. Helena; and the interval of time which separates them is short. The set-back drum of the latter, with its dome, had only to be raised on open arches in order to become Constantine's annular rotunda. Its date must fall in the years before 328,³ when the works connected with the transformation of Byzantium into 'New Rome' were taken in hand.⁴

¹ G. D. SCAMOZZI, *op. cit.*, fols. 56-8.

² RIVOIRA, *Moslem Architecture*, pp. 59, 60.

³ RIVOIRA, *Lombardic Architecture*, vol. ii,

pp. 25, 26.

⁴ VAN MILLINGEN, *Byzantine Constantinople*, pp. 15, 33.

For operations on this vast scale many architects and marble-workers must have been summoned from Rome and Italy, and, what is more, the best of their class. That the former were scarce, except in Italy and the Latin provinces of Africa, is clear from the edicts of Constantine, Constantius II, and Constans.¹ That Italian marble-workers were employed in the building of New Rome may be inferred from the mention by Lydus of a portico erected by Campanian workmen and marble-workers from Naples and Pozzuoli.² The result was a sudden cessation at Rome of the great series of progressively daring and advanced experiments in vaulting. Their place was taken by buildings which, though on a grand scale, had only timber roofs.

For these reasons it is incredible that the Constantinian rotunda can have been erected after the year 327; all the more as imitations of it, with some modifications, were carried out, as may be seen from Montano³ and Bramantino.⁴ We may date these imitations and derivations in the form of tombs in the reign of Constantine, on account of the conditions which prevailed in Rome consequent on the transfer of the seat of government (330), and the measures taken by the emperor to its detriment. Besides, some of these annular tombs are very large, the external diameter of one being 18.30 m. (nearly 60 ft.).⁵



Fig. 296. S. Costanza. Tower above the eastern part of the annular vault

The rotunda, then, must be placed: on grounds of style, in the years later than 313, the probable date of the Mausoleum of St. Helena; on account of the conditions of the building trade in Rome brought about by the works at Constantinople, in the years before 328. Artistic considerations are consistent with this date. Within these two limits I would select the years 324-326; and I proceed to state the reasons in favour of this date and of my theory about the original destination of the building.

(1) It is improbable that Constantine would have erected for the Imperial ladies of his family a mausoleum surpassing in size and in the originality of its design, and, above all, in its internal decorations, the one which he had previously raised for his mother.

(2) The cruciform arrangement of the interior suggests an affirmation of the fateful sign associated with the battle of the Milvian bridge.

(3) The tower-like superstructure in front of the central recess (where were pictured the Redeemer seated in the midst of the Apostles, and the crowned lamb

¹ HAENEL, *Codices Gregorianus Hermogenianus Theodosianus*, xiii, 4; I, 2, 3.

² *Corp. Script. Hist. Byz.*, LYDUS, *De Magistratibus*, iii, p. 266.

³ *Scielta de varii tempietti antichi*, tav. 30; *Raccolta de templi*, &c., tavv. 5, 22, 23, 40.

⁴ MONGERI, *Le rovine di Roma*, tavv. xlvii, lv.

⁵ *Op. cit.*, tav. xlvii.



Fig. 297. Porphyry Sarcophagus of S. Costanza. (Vatican Museum of Sculpture)

with the sheep moving towards the city of Jerusalem) gave it a peculiar emphasis which is more appropriate to the emperor than to his female relations. Besides, beneath it may have stood the silver altar mentioned above.

(4) The sarcophagus (the dimensions being 2.35×1.58 m. or 7 ft. 8 in. $\times$ 5 ft. 2 in.) which stood in the said recess, moved to San Marco in 1467, but restored

to its original place in 1471,¹ and now one of the ornaments of the Hall of the Greek Cross in the Vatican, was evidently made when it received the mortal remains of Constantia. Ciampini gives a good illustration of it, which is accurate :² ours is from a photograph (fig. 297).

Any one who examines it with a practised eye will find that, except for the base and the lining inside, which are new, the restoration is confined, apart from repolishing, to a very few repairs which can be detected by the difference in the grain of the porphyry. This is easy to understand, for the sculpture is in half-relief continuous throughout with the plane surface. Compared with the sarcophagus of St. Helena, which is treated to a large extent in high relief, a very marked decadence is noticeable, and this points to the period which followed the change of capital.

(5) The great celebrity of the cult of St. Agnes at Rome makes it probable that the basilica raised by Constantine over her tomb³ was among the first erected after 313.⁴ It is not surprising if, after he had become master of the world and had made Christianity the religion of the State (324), Constantine, following his mother's example, had his own tomb built close to the basilica.

(6) The emperor was permanently estranged from Rome by the tragedies of the year 326 and the insults hurled at him by the Roman populace, roused by the cruel executions of the young Licinius and of Crispus, insults which reached their climax in the satirical verses fastened to the gate of the Palatine :

‘Saturni aurea saecula quis requirat ?
Sunt haec gemmea, sed Neroniana’⁵

It was then that there took root in his mind the idea of degrading the city and transferring to another site the power and majesty of the throne : an idea which may be traced back in germ to his Illyrian predecessors, who were more interested in protecting the Balkan peninsula from barbarian invasions than Rome and Italy.

And so his tomb remained without an occupant, and was available for the Imperial ladies of his family. Two of these, Constantia and Constantina, the emperor's sister and daughter respectively, had been christened in the baptistery of Sant' Agnese.⁶ Nothing would be more natural than that the unhappy wife of the elder Licinius (307–323) and still more unhappy mother of the younger Licinius (d. 326), who did not long survive the inhuman execution of her son, and is supposed to have died after the Empress Helena (328), about 329 or 330,⁷ should be the first to find in it her last resting-place, and to confer on the monument her own name, so conspicuous alike for her virtue and her misfortunes. In this way we can understand, as Garrucci noticed,⁸ that when the body of Constantina was deposited in it, the building itself had already become an Imperial tomb-house.

¹ LANCIANI, *Storia degli scavi*, vol. i, pp. 72, 73, 75.

² CIAMPINI, *De sacris aedificiis*, p. 130, tab. xxxi.

³ DUCHESNE, *Lib. Pont.*, vol. i, pp. 180, 196, 197.

⁴ ARMELLINI, *Il Cimitero di S. Agnese sulla Via Nomentana*, p. 25.

⁵ *Mon. Germ. Hist.*, *Auctores antiquissimi*,

vol. viii, APOLLINARIS SIDONIUS, *Epistolae*, v, 8. [‘Who would want Saturn's age of gold? The present age is one of gems; only it is Nero's.’]

⁶ DUCHESNE, *Lib. Pont.*, vol. i, pp. 180, 196, 197.

⁷ TILLEMONT, *Histoire des Empereurs*, vol. iv, p. 245.

⁸ *Storia dell' Arte cristiana*, vol. iv, tavv. cciv–ccvii.



XVII. THE SUCCESSORS OF CONSTANTINE

AS a conclusion to the above brief account of the principal buildings in Rome of the Constantinian age I will add a few considerations on the consequences, so far as architecture is concerned, of the transfer of the capital of the Empire from Old to New Rome. For that event Constantine was not solely responsible. The vast plan for the reform of the Roman system of



Fig. 298. Nocera dei Pagani. Santa Maria Maggiore
(Fourth-fifth century). Exterior

government and the defence of the Empire, to be carried out at the expense of the city of Rome, was completed by him, but it had been devised and partly executed by Diocletian.

This loss of headship, which laid the West at the mercy of the barbarians, has often been thought to have been the cause of the enormous disasters which from this time forward fell upon the Eternal City. This is a view with which I do not agree.

The Rome of the Republic and the Empire had at last completed her course : cities like other things have their day. She no longer had the strength to

support her heavy burden of years and her long and exhausting exercise of power. The abolition of the Praetorian Guard was the last blow to her security and prestige. She had lost the use of arms. As far back as the days of Septimius Severus the youth of Italy had been excluded from that rude but noble profession when the praetorians began to be recruited from the legions on the frontiers; and later Gallienus had forbidden the holding of any military post by a senator. She was unfitted for the needs, the regulations, the institutions of the new age: the memory of her triumphs and days of prosperity was bound up with the traditions of paganism. The Senate was pagan, and so, too, was the majority of the aristocracy. The people, though fallen from its ancient standards of virtue, owing mainly to Oriental influences, was not yet reduced to the herd of slaves and flatterers which Constantine, brought up in the courts and armies of the East, would have liked, but still preserved the old unbridled spirit of free criticism on its master's doings and of familiar behaviour towards him, and ill brooked the exercise of absolute dominion in a sovereign who was not bound to Rome and the Senate by any ties of ancestry or tradition.

In this way the dethroning of Rome was really to her advantage; for otherwise she would in any case have sunk not to rise again—still less to reach once more, as she did, a position of supremacy.

On the other hand, isolated, so to speak, with regard to the Empire, the Church of Rome, raised by the bounty of Constantine from her original humble state to one of splendour, succeeded step by step in making herself the spiritual heir of the old Imperial power, the laws and hierarchy of which she adopted, and copied its regulations and forms. Later, when the temporal was added to the spiritual sovereignty, she set up the other civilizing and dominating force of the Middle Ages, the Papacy. The seat of empire was no longer in Rome, but above the she-wolf's cave the eagle's nest still kept its place.

Without the act of Constantine the Eternal City would not now, clothed with the mantle of some three thousand years of greatness, be moving in company with the new Italy, towards a new and glorious destiny. Nor would the triumphs of Italian architecture in the fifth and sixth centuries have taken shape, with all their wealth of lessons for both West and East.

When the seat of government was transferred to Byzantium, and most—and we may be sure all the best—of the Roman architects and builders had flocked thither, we find, almost immediately, that there was not only a check in the advance of vault construction, but that the erection of vaulted buildings of any importance, whether secular or religious, practically came to an end. So much so that we have to come down to the fifth century in order to find the twin rotundas of the Vatican, the 'Mausoleum Augustorum', fashioned on the ancient models of the Imperial age (fig. 233). But when Christianity won its victory it was



Fig. 299. Plan of S. Maria Maggiore at Nocera dei Pagani. (From HÜBSCH, pl. xvii)

Rome that gave birth to the Latin type of basilica-church, whether of simple or cruciform plan.

In other parts of Italy the consequences were different. The architects, while starting from Roman works, in which it is rare not to find the germs of all the later developments of architecture, freed themselves from the hard and fast lines of the tradition of Roman State building, and went on to evolve works which received a new impress from the Italian genius, and marked the transition from the Roman to the medieval style—a transition which was developed by Italian agency, and not Byzantine, as is erroneously believed in some quarters.¹ In these works we see the exhaustion of the principles and technique of the Roman school, but at the same time remarkable improvements and modifications. In them the static principle, the object of which was lightness of construction and therefore saving of expense, was based on the independent and permanent functioning of

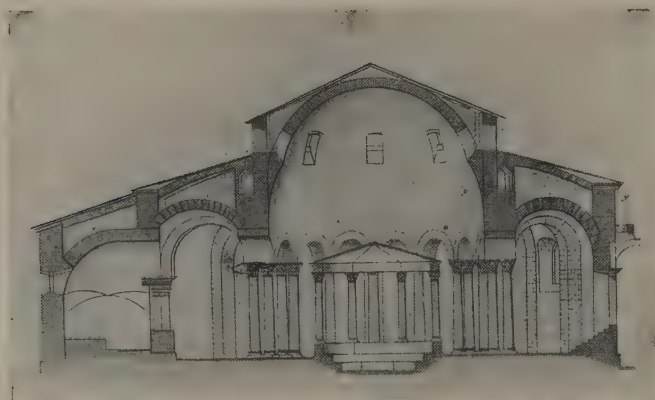


Fig. 300. Section of S. Maria Maggiore, Nocera dei Pagani
(From HÜBSCH, pl. xviii)

the centres of resistance, that is to say, at the nodal points, and of the counter-thrusts which in the past, partly fused with the structural mass, had mainly exercised their most important and useful function during the period of construction and settlement. It has been stated by Hübsch² that the vaulting of these buildings is of so bold and perfect a character that it is not surpassed by that of the Romanesque and Pointed periods.

It was under these circumstances that the architects and builders of Campania began to erect, about the close of the fourth century, or at latest in the early years of the fifth, the central-planned church of Santa Maria Maggiore near Nocera dei Pagani³ (figs. 298, 299). The beauty of its many marble pillars, all plundered like the capitals, from older buildings, suggests the years following

¹ *Annales des Ponts et Chaussées*, iii (1910), pp. 7-45, DE DARTEIN, *Notice sur la vie et les travaux de M. Auguste Choisy*. ROHAULT DE FLEURY, *Les monuments de Pise au moyen-âge*, p. 47.

² *Monuments de l'Architecture chrétienne*, col. xiv.

³ RIVOIRA, *Lombardic Architecture*, vol. i,

pp. 11, 12. [Before publication the author had intended to revisit the church at Nocera dei Pagani and also the buildings at Naples and Pompeii. The reader therefore should remember that this part of the book lacks its final revision, and also the additions, perhaps changes, which a further study of the monuments might have rendered necessary.]



Fig. 301. Interior of S. Maria Maggiore, Nocera dei Pagani



Fig. 302. The Regolini-Galassi tomb at Cervetri



Fig. 303. Castellina in Chianti. Entrance to Palaeo-Etruscan tomb

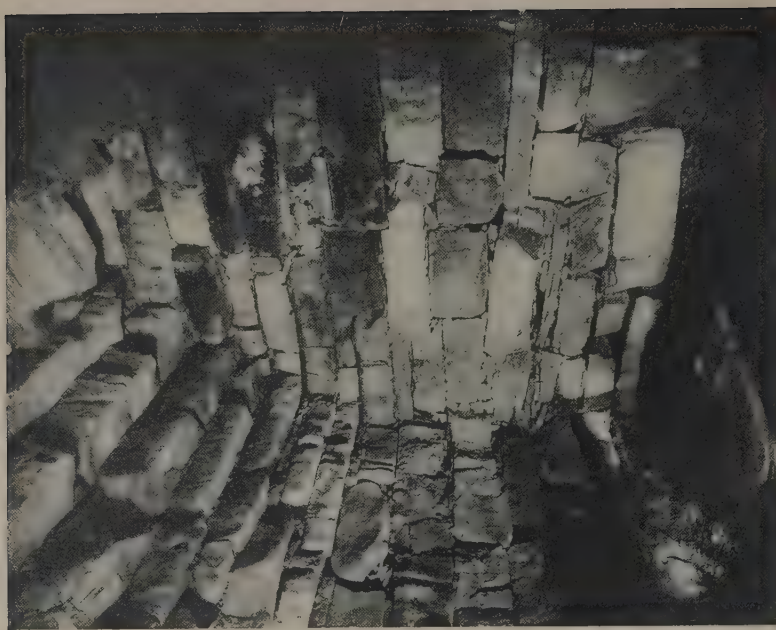


Fig. 304. Interior of Palaeo-Etruscan tomb at Castellina in Chianti

392 when Theodosius I banished the pagan worship from the Empire, or else the year 408, when Arcadius, Honorius, and Theodosius II ordered the destruction of the temples in which it had been carried on.¹

In this direct descendant of the Mausoleum of Santa Costanza at Rome, the internal diameter of which is 24 m. (78 ft.), we should note the raking annular barrel-vault of the ambulatory, which as its section shows tends to press on the lower part of the outer wall. This barrel-vault is divided into sections by stout transverse visible arches, carrying portions of sloping wall, and supported by substantial wall-piers which are designed to help the barrel-vault to neutralize to some extent the thrust of the dome, and at the same time to enable the thickness of the outer wall to be reduced to only 1.10 m. (3 ft. 7 in.). The ovoidal-shaped dome, constructed of small worked materials and 15 m. (49 ft.) high at its apex, recalls the later one of San Vitale at Ravenna, and is no longer muffled up after the Roman fashion, but is free and set immediately on the arches of the colonnade. Its section shows a break at about one-third of the height, that is to say, at the base of the windows² (figs. 300, 301). This part of the dome is built in horizontal courses, but the upper part consists of radiating lines. The object of this was, as Hübsch noticed,³ to reduce the weight and consequently the oblique thrust of the upper section of the dome. The exterior was covered by a wooden roof.

The dome of Santa Maria Maggiore provides an opportunity for giving a short account of the evolution which decided the form of elongated domes generally; but we will confine ourselves to examples found in Italy and the adjacent islands.

The germ, whether transplanted or not from other shores and other regions, is to be found in the chamber tombs with hood-shaped roofs. The roof is sometimes formed of slabs or squared blocks of stone, resting on the side-walls and leaning towards the middle line of the chamber, where they meet a horizontal course, as, for instance, in the Regolini-Galassi tomb at Cervetri⁴ (fig. 302), or the one from Orvieto known by the name of 'Crocefisso del Tufo' (sixth century B.C.), now re-erected in the garden of the Archaeological Museum at Florence,⁵ in which the top course is replaced by a wedge. In other cases there are horizontal courses of flat stones overlapping in the way shown, to take one of many examples, in the chambers of the tumulus at Castellina in Chianti (figs. 303, 304).

¹ HAENEL, *Codices Gregorianus Hermogenianus Theodosianus; De paganis sacrificiis et templis*, XVI, x, 12, 19.

² [The words 'at the base of the windows' were followed in the manuscript by a mark of interrogation.]

³ *Monuments de l'Architecture chrétienne*, cols. 35-7, pls. xvii, xviii.



Fig. 305. Viterbo. Etruscan tomb near Riello
(From CANINA, *Etruria*, ii, tav. ci)

⁴ CANINA, *L'Antica Etruria Marittima*, vol. i, pp. 173-91, tavv. l-liii. *Collezioni archeologiche artistiche e numismatiche dei Palazzi Apostolici*, vol. vii. *Materiali per la Etnologia antica Toscano-Laziale*, vol. i, pp. 79-492, PINZA, *La tomba Regolini-Galassi*.

⁵ MILANI, *Il R. Museo Archeologico di Firenze*, vol. i, p. 292.



Fig. 306. Rome. Lower chamber of the 'Tullianum'. Present condition, showing the conical vault cut off by an inserted floor



Fig. 307. Tholos tomb at Cuma

The first attempt to apply this primitive form of roof to a chamber of curvilinear plan we find at the beginning of things in the 'nuraghi' of Sardinia, a type of structure developed by its inhabitants perhaps earlier than any other peoples of the Mediterranean lands.¹ As one of many examples I may mention the nuraghe of Palmavera near Alghero, where the older conical tower, perhaps as early as the middle of the second millenium B.C., constructed of courses of stones laid alternately as headers and stretchers, bedded and regularized with layers of

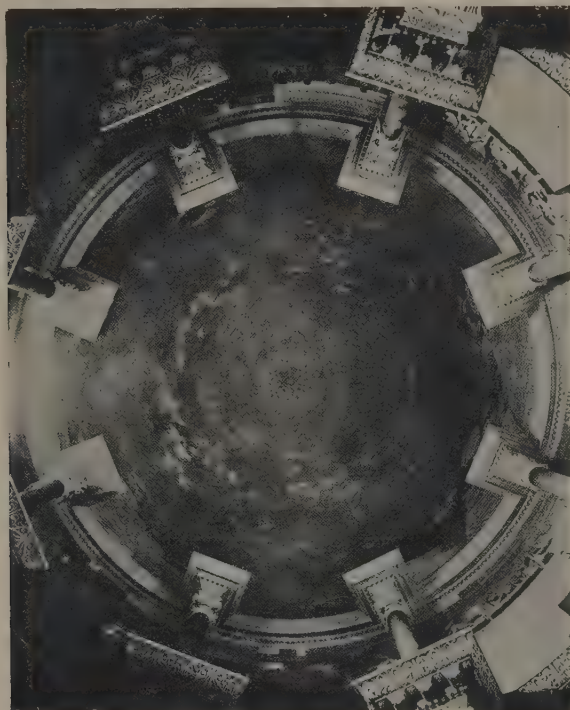


Fig. 308. Spalato. Dome of the Imperial Mausoleum, now the Cathedral (300-305)

clay and stone chippings, has a lower chamber of almost elliptical plan, covered with a conical vault formed by the gradual drawing in of the courses, with a key-stone at the top.²

Next we find it in the well-temples ('templi a pozzo') of the same island, the expression of aboriginal and pre-Punic religious and ritual traditions. An example is the one at Mazzani near Villacidro, where the sacred well is covered by an elongated cupola formed by rings of flat stones, the diameter of which gradually diminishes from the base to the keystone at the top.³

¹ *Monumenti antichi*, vol. xviii, pp. 5-120, A. TARAMELLI, *L'altipiano della Giara di Gesturi in Sardegna e i suoi monumenti preistorici*.

² *Monumenti antichi*, vol. xix, cols. 225-304,

A. TARAMELLI, *Il nuraghe Palmavera presso Alghero*.

³ *Monumenti antichi*, vol. xxiii, cols. 313-436, A. TARAMELLI, *Il tempio nuragico ed i monumenti primitivi di S. Vittoria di Serri (Cagliari)*.

The Etruscans also used it in rock-cut tombs ; for instance, one by the Via Faulle in the neighbourhood of Riello near Viterbo ¹ (fig. 305).

At Rome the 'Tullianum', at the foot of the Capitol, in its original form provided an early example. Originally it was circular in plan, constructed of

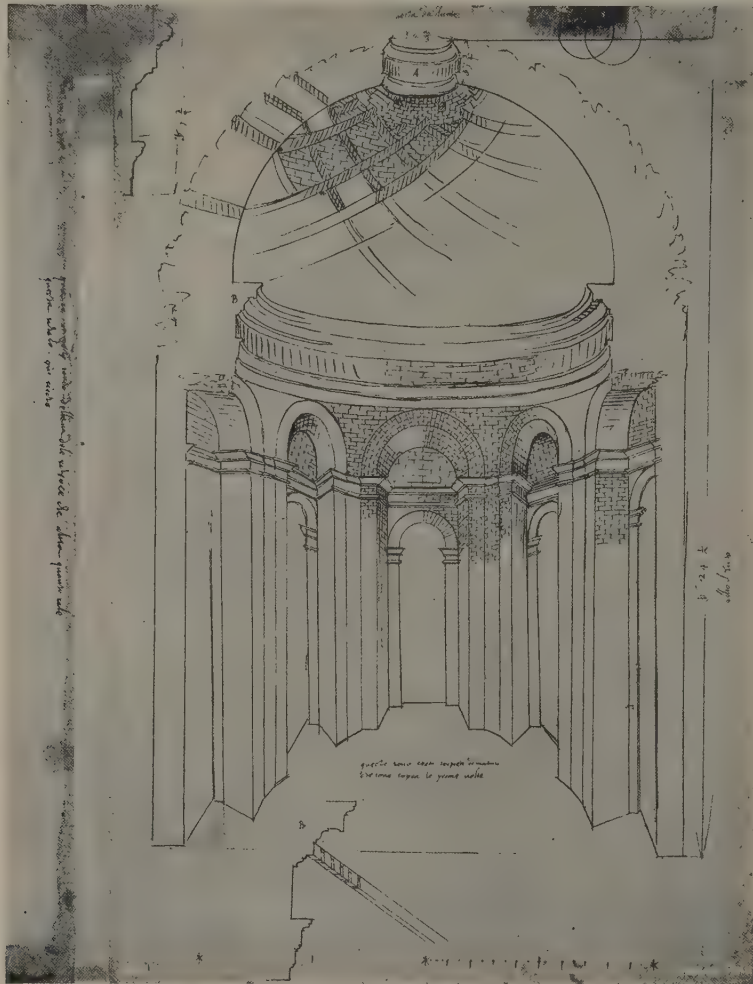


Fig. 309. Circular Roman building. (From a drawing in the Uffizi.

FERRI, *Indice*, p. 217, no. 1330 verso.)

blocks of squared tufa, with a conical vault formed by the successive contraction of the courses. It has been explained as a primitive tomb-chamber, remodelled when it was converted into a prison ; ² and it has even been thought to be

¹ CANINA, *op. cit.*, vol. ii, pp. 70, 167, tav. ci.

² *R. Accad. dei Lincei, Rendiconti*, ser. v, vol. xi, pp. 226-39, PINZA, *Di un sepolcro a cupola di tipo miceneo nel pendio del Campi-*

doglio. [Fig. 21 in MIDDLETON'S *Remains of Ancient Rome* (vol. i, p. 152) gives a sectional view showing the outline of the conical vault.]

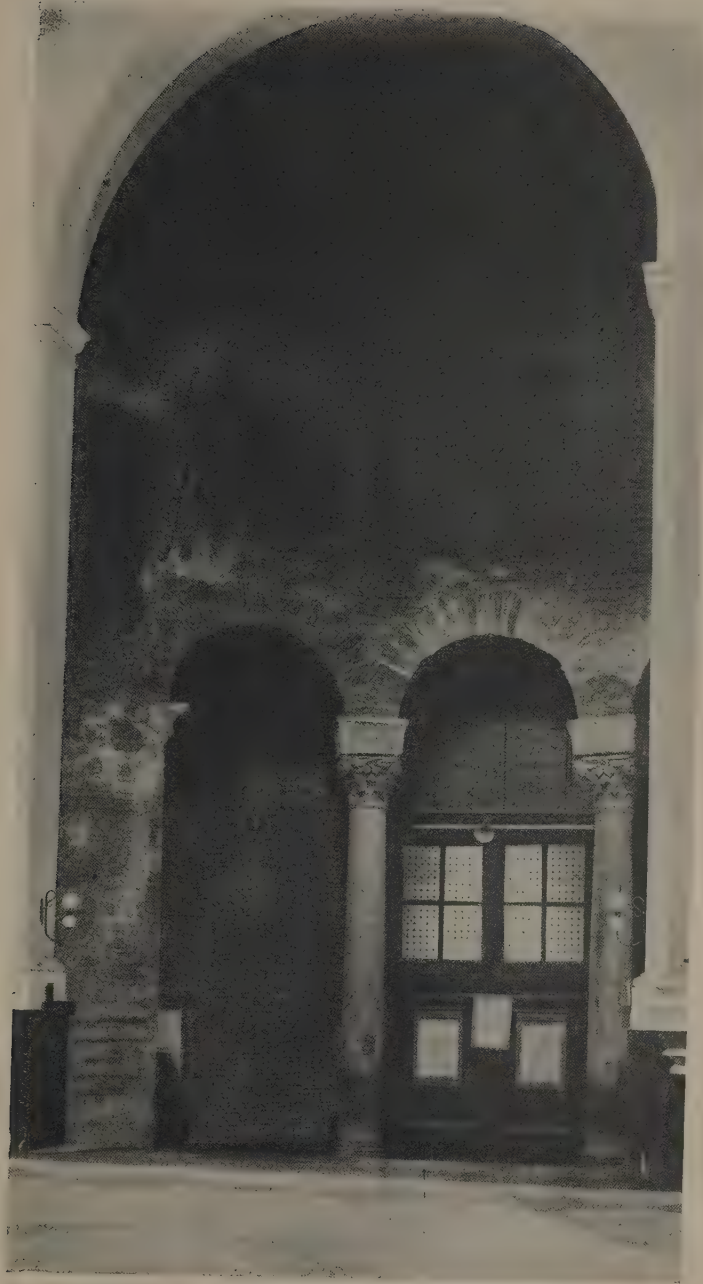


Fig. 310. Apse of San Giorgio Maggiore, Naples

actually a tomb of the kings of Rome, turned into a prison in 632 B.C.¹ (fig. 306).

In Campania an example going back to the early years of the third century B.C. is to be found in the necropolis of Cuma, where there is a tomb constructed of courses of oblong blocks of tufa, set without mortar, seven of which project one beyond the other and form the conical vault, closed at the top by three slabs² (fig. 307).

False cupolas of similar type, the curve of which was determined by their structural weakness, as it was known that, in a vault, the less the curve departs

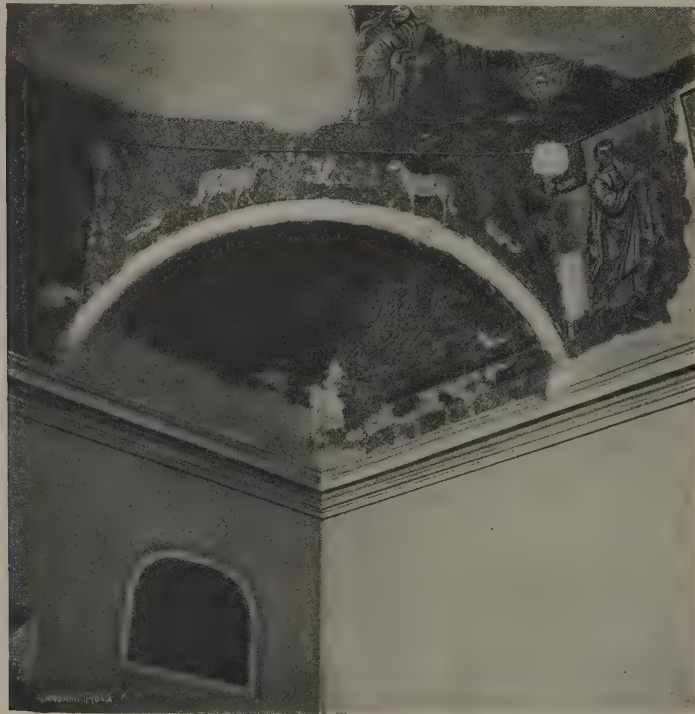


Fig. 311. Naples. San Giovanni in Fonte. One of the pendentives of the dome (Fifth century)

from the vertical line the less is the thrust, provided the suggestion for the Campanian builders of the 'Sudatorium' of the Stabian Baths, and of the baths near the Forum in Pompeii, where we find for the first time in Italy an ovoidal cupola which may be truly and properly so called. They are formed of Sarno stones, laid by hand in an irregular fashion with a free use of mortar.

These Campanian examples must have been in the minds of the Roman State architects of the dome of Diocletian's mausoleum at Spalato (fig. 308) (A. D. 300-305), where the small arches set fan-wise show no derivation from any Eastern

¹ *R. Accad. dei Lincei*, op. cit., vol. ix, p. 297, MILANI, *Locus sacer, mundus e templum di Fiesole e Roma*.

² *Monumenti antichi*, vol. xiii, pp. 201-25, PELLEGRINI, *Tombe Greche arcaiche e tomba greco-semitica a tholos della necropoli di Cuma*.

vault, but are connected with the one belonging to an annular Roman building, a drawing of which by some unknown sixteenth-century hand is preserved in the Uffizi at Florence¹ (fig. 309).

Thus it was a traditional profile which the architect of Santa Maria Maggiore at Nocera dei Pagani used for his dome; and at the same time he freed it from its limitations and perfected its construction by the introduction of the radial courses.

At about the same date we find the builders in this part of Italy introducing in the Basilica Severiana or church of San Giorgio Maggiore at Naples (fig. 310), founded by Bishop Severus (367–about 387),² the use of the pulvin (or dossieret) in the shape of a truncated inverted pyramid. It was derived from the broken architrave set on capitals of columns, as in the tomb of the Cerenii near Rome (see p. 192).



Fig. 312. Ravenna. A tube from the apse of the Basilica Ursiana. (From BUONAMICI, *Metropolitana di Ravenna*)

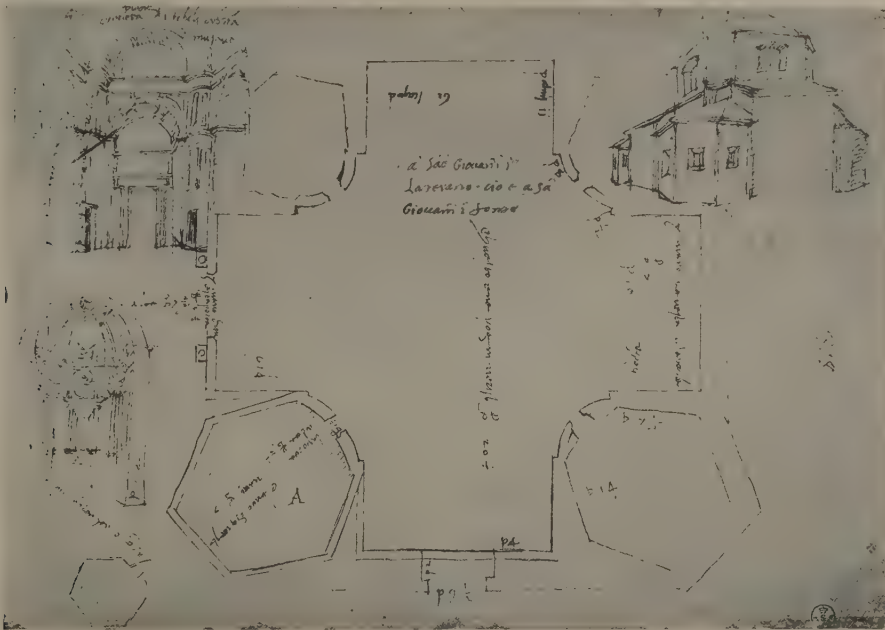


Fig. 313. Plan and elevations of the Oratory of the Cross at the Lateran. From a drawing in the Uffizi. The plan came into the hands of B. Peruzzi, who added the sketches of the section and elevation in the margin. A. BARTOLI, *Monumenti Antichi di Roma nei Disegni degli Uffizi* (Rome 1919), vol. i, tav. cviii, fig. 193

Not long after, craftsmen of the same district erected San Giovanni in Fonte, or the 'Fonte maggiore', attached to the cathedral of Naples (fig. 311), and the

¹ RIVOIRA, *Moslem Architecture*, p. 70.

² *Mon. Germ. Hist., Scriptores Rerum Lango-*

bardicarum, pp. 405, 437. GAMS, *Series episcoporum Ecclesiae Catholicae*, p. 904.

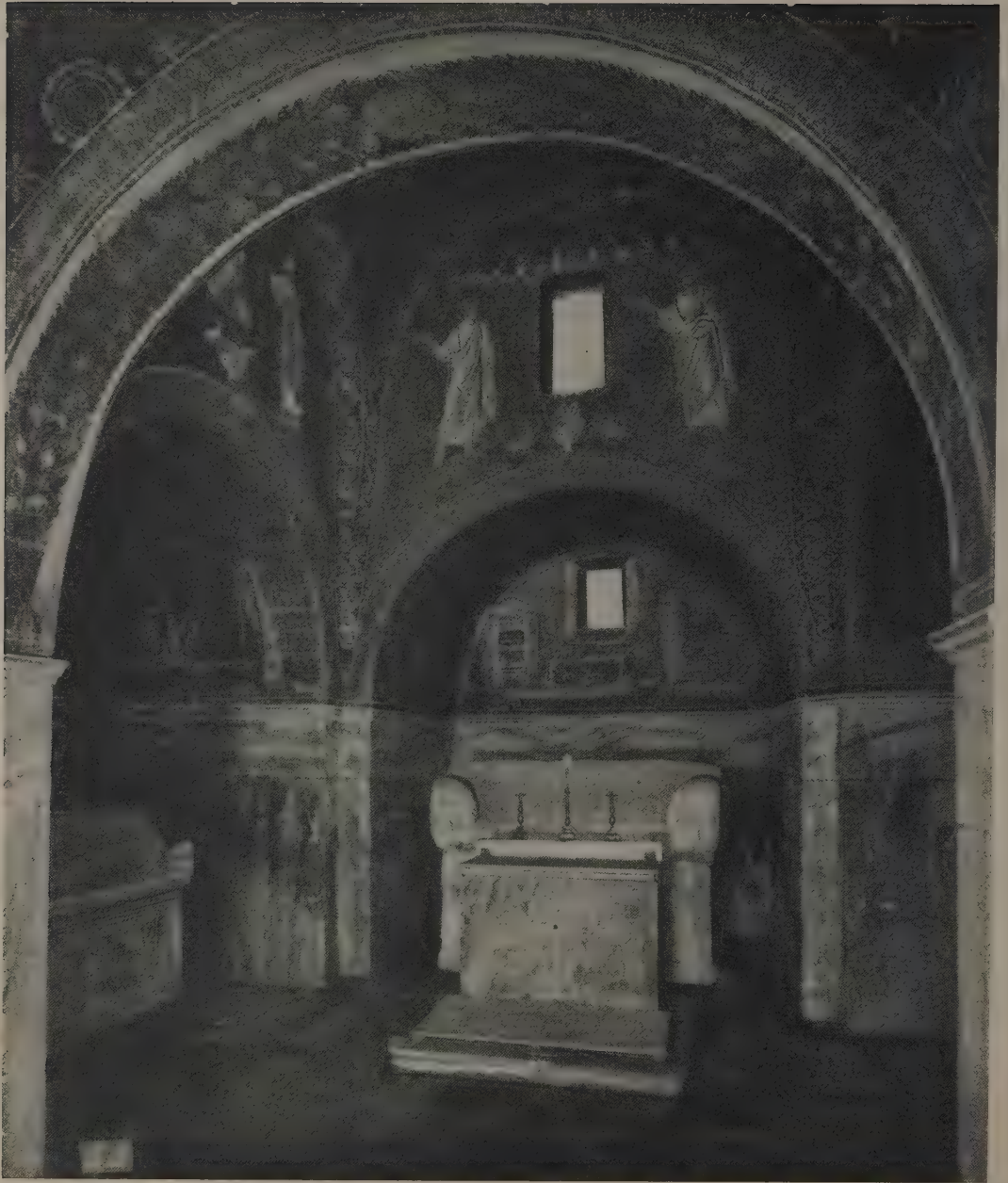


Fig. 314. Ravenna. Mausoleum of Galla Placidia (about 440). The exterior appears in the foreground of fig. 320

work of Bishop Soter (465-846).¹ Here the square space, each side of which measures 7.60 m. (about 25 ft.), was made to pass into the hemispherical dome by means of simply vaulted or hood-shaped pendentives. It has been stated that these pendentives are the earliest to be found in a Christian building, at a time when they already formed the most characteristic element of Sassanian architecture.² The truth is they were invented in Italy, and those in Soter's baptistery, which are simply the hood-shaped top of Roman angle-niches, transferred from the bottom of the drum to the base of the dome, are the prototypes of their kind either in the West or East.³

In their turn the architects of Ravenna, coming originally from the School of Milan, and then forming a local school of their own, proceeded, between the years 370-384, to apply the pulvin to the capitals of the columns in the Basilica Ursiana

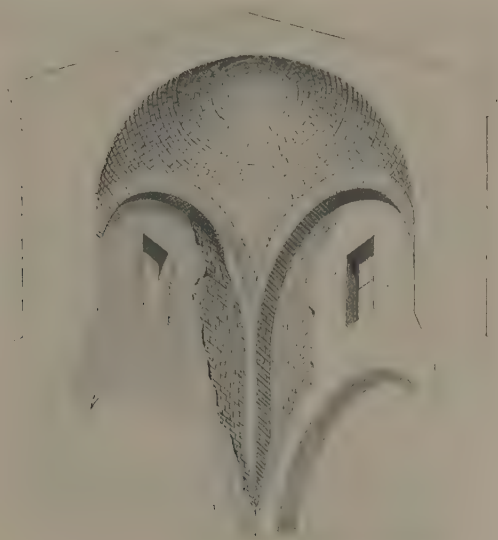


Fig. 315. Mausoleum of Galla Placidia.
Construction of the dome

or church of the 'Anastasis' at Ravenna, erected by Archbishop Ursus (370-396).⁴ The function of this architectural member, whether invented in Campania or at Ravenna,⁵ was to concentrate the pressure of the arches on the supports, and make them slighter without affecting the real solidity of the building.

Nor was this all, for in the same church they constructed the half-dome of the great apse with a double spiral of terra-cotta tubes (each a Roman palm long, i. e. 0.223 m. or about 8¾ in.) of syringe shape, the nozzle of one being inserted in the

¹ *Mon. Germ. Hist.*, *ibid.*

² BERTAUX, *L'Art dans l'Italie méridionale*, vol. i, pp. 40-1.

³ RIVOIRA, *Moslem Architecture*, pp. 124, 131, 239.

⁴ *Mon. Germ. Hist.*, *Scriptores Rerum Longobardicarum*, AGNELLUS, *Liber pontificalis ecclesiae*

Ravennatis, pp. 288, 289. *Studi Storici*, vol. vii, pp. 399-409, 461-79, GIANI, *Alcune osservazioni su la cronologia di Agnello*. BUONAMICI, *Metropolitana di Ravenna*, tav. A.

⁵ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 10-18; *Moslem Architecture*, pp. 109, 274.



Fig. 316. Ravenna. The Baptistery of Neon (fifth century)

open end of the next, and firmly fixed with mortar.¹ These tubes were the result of the reduction to their lowest terms of the amphorae or jars which we have often mentioned (fig. 312). The half-dome itself was covered with a framework of beams and boards carrying sheets of lead.²

This was the first example of a spherical vault constructed in this manner: no earlier instance of certain date has yet been discovered either in the western or the eastern world. Rome, whence the idea originally came, employed it for the first time when Pope Hilarus (461-468) enlarged the Lateran Baptistery (432-440) by the addition of three chapels, one of which, dedicated to the Cross, and demolished in 1629, we know had its central cross-vault formed of tubes.³ I append

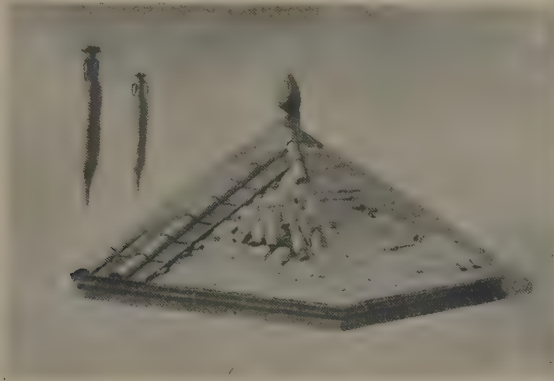


Fig. 317. Mausoleum of Galla Placidia. Roof of the dome showing construction and specimens of the amphorae. From a drawing by A. Azzaroni. Ricci, *Mausoleo di G. Placidia*, fig. 38

a plan of this chapel taken from a drawing by an unknown hand, together with two sketches of the interior and one of the exterior by Baldassare Peruzzi, preserved in the Uffizi at Florence and numbered 438 (fig. 313).

The apse of the Basilica Ursiana had two other peculiarities worth notice, as they were the first of their kind whether in the West or in the East: the eastern orientation, and the polygonal outline of the exterior.⁴

A little later the same school of craftsmen also built in Ravenna the Mausoleum of Galla Placidia (about 440) in which the dome (constructed of concentric courses of brick with filling-in of amphorae set in lime, on which rest the roof-tiles) and the pendentives form part of one and the same sphere, thus providing the earliest specimen of Roman supports of this kind in brick, in a complete form⁵ (figs. 314, 315, 317, 320).

¹ [On these tubes see GIOVANNONI in *The Legacy of Rome*, p. 449 and notes. They occur specially in Roman Africa.]

² BUONAMICI, *Metropolitana di Ravenna*, p. ix, tav. A.

³ DUCHESNE, *Lib. Pont.*, vol. i, pp. 234, 236, 242, 245. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 18-21, 39, 69, 84; *Moslem Architecture*,

pp. 272, 273.

⁴ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 8, 9; *Moslem Architecture*, pp. 104-7, 203.

⁵ TARLAZZI, *Memorie sacre di Ravenna*, pp. 373-6. C. RICCI, *Il Mausoleo di Galla Placidia in Ravenna*. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 28-35; *Moslem Architecture*, pp. 262, 286-7.

The next step was the erection of the Baptistery of Neon (449 or 458-477), as an adjunct of the Basilica Ursiana. Here the tubular construction of the apse



Fig. 318. Exterior of the Baptistery of Neon (tower of the Cathedral in the background)

in the cathedral, combined with the pendentives just described, was applied in a conspicuous way to the dome, which has a diameter of 11.30 m. (about 37 ft.) (fig. 316). Owing to the extreme lightness of the material used, and to the fact that each ring resists the thrust of those which press on it, the vault is almost free from any oblique thrust; and this permitted the circumference wall to have a

thickness no greater than 67 cm. (2 ft. 2 $\frac{3}{4}$ in.).¹ As the dome of the baptistery, owing to its great lightness, could not carry a covering resting directly upon it, it was protected from the weather by a wooden roof, a device which marks the abandonment of the Roman practice of either leaving the extrados open to view or placing the roofing directly upon it (fig. 318). We have already noticed a similar treatment in Santa Maria Maggiore at Nocera dei Pagani.



Fig. 319. Constantinople. SS. Sergius and Bacchus (527-532)

The last of their works was the church of San Vitale, erected a year before SS. Sergius and Bacchus (fig. 319), and six years before St. Sophia at Constantinople, the most singular, elegant, ingenious example of the central type of church, vaulted throughout, that the first five centuries of the Christian era have to show (figs. 320, 321, 322). It is a testimony to the many-sided genius of the Latin race.

We may pass over the contemporary (or nearly so) San Lorenzo Maggiore at Milan, as its present state does not allow a comprehensive and certain estimate of it to be made; but, so far as one may infer from what is preserved, it seems to have been not inferior in architectural importance to San Vitale.²

¹ *Scriptores Rerum Langobardicarum*, AGNEL-LUS, op. cit., p. 292. BUONAMICI, op. cit., p. ix. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 37-9; *Moslem Architecture*, pp. 234, 235, 273.

² RIVOIRA, *Lombardic Architecture*, vol. i,

pp. 72-4; *Moslem Architecture*, pp. 131, 286, 323. *Politecnico* (1911, nos. 11-12), MON-NERET DE VILLARD, *La chiesa di S. Lorenzo in Milano*.



Fig. 320. Ravenna. San Vitale (526-547). Mausoleum of Galla Placidia in the foreground

These were the two buildings to which Cassiodorus clearly alluded when he refers to the new style.¹

In San Vitale scientific construction and equipoise, and also the methods of the School of Ravenna, reach their zenith.² The prevailing material, except in the central dome, being brick, the main support of the structure is formed by the eight large piers at the angles of the outer walls connected by arches with the piers which carry the dome, and forming buttresses to it (fig. 323). In this way the thickness of the walls themselves, which only perform a secondary function, could be reduced to merely about 0.95 m. (3 ft. 2 in.); and they were strengthened on the outside by bold pilasters, which were added mainly on account of the height of the walls, corresponding as they do to the two stories of aisle and gallery (fig. 320).

The dome is of conical form, made of a double coil of terra-cotta tubes, inserted in one another, and buried in lime. The tubes, according to the measurements which I took in 1906, are 16 cm. ($6\frac{1}{4}$ in.) long and 5 cm. (2 in.) thick. The octagon of the central space passes into the circle at the base of the dome by means of angle-niches taken out of the solid wall (fig. 324). This is the earliest example of Roman angle-niches, such as those we noticed in the House of Augustus on the Palatine, raised from the floor to the base of the dome in order to form a raccord or pendentive; and it is the prototype of the pendentive of niche form.³ The profile and the structure of the dome are such that they exercise hardly any pressure except a moderate vertical one, which is neutralized by the counter-thrusts of the great semicircular recesses, of the chancel, and of the piers in the outer wall.

The cross-vault over the presbytery has not the Roman semi-elliptical curve, but is considerably raised (looking almost like a dome) with the threefold object: of relieving its own weight, considering the slightness of the supports; of giving strength at the weakest point; and of displaying better the mosaics which form its decoration. So far as I know there is no record of any earlier vault of this type of indisputable date.⁴

The works of the School of Campania, and still more of that of Ravenna, together with the inexhaustible resources of the old Roman School, provided at a later date useful suggestions for the Lombard gilds when they, starting on a new career which led to other conceptions and other forms, initiated those long and laborious enterprises which were to end in the creation of the Lombardic vaulted basilica, the great trunk from which sprang the branches of the principal and

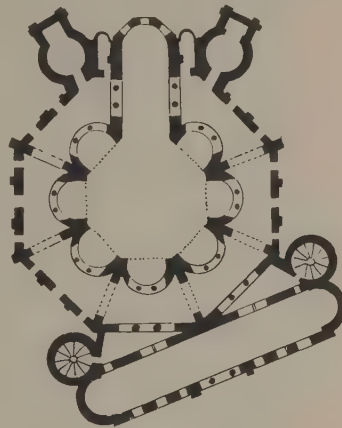


Fig. 321. Plan of S. Vitale, Ravenna

¹ *Mon. Germ. Hist., Auct. antiquiss.*, vol. xii, CASSIODORUS, *Variae*, vii, 15, pp. 211, 212.

² *Mon. Germ. Hist., Scriptores Rerum Lombardicarum*, AGNELLUS, *Liber pontificalis ecclesiae Ravennatis*, pp. 318, 319, 321, 329, 330. RIVOIRA, *Lombardic Architecture*, vol. i, pp. 56-72;

Moslem Architecture, pp. 318-23.

³ RIVOIRA, *Moslem Architecture*, pp. 80, 124-31, 157, 164, 239.

⁴ RIVOIRA, *Lombardic Architecture*, vol. i, pp. 57, 199, 226, 248.



Fig. 322. Interior of S. Vitale

secondary styles of architecture which flourished in so large a part of Europe during the eleventh and twelfth centuries, and are generally known as Romanesque.



Fig. 323. S. Vitale, Ravenna. Abutments of the dome

And when the Islamic pointed-arch system was grafted on to the Lombard basilica, there was born in the lands north of the Alps the pointed-arch style, erroneously described as Gothic.¹

¹ RIVOIRA, *Lombardic Architecture*, vol. ii, p. 239; *Moslem Architecture*, pp. 168, 222. *Atti e Memorie della R. Accademia di S. Luca*,

Annuario 1913-1914, pp. 25-31, RIVOIRA, *Roma, l'Italia nella creazione delle antiche architetture a volta*.

Finally—and this is essential—it was from the discoveries of the Roman, Campanian, and Ravennate schools, the last two acting as intermediaries between the West and the East, that the Byzantines, though with a different technical method in the construction of vaulting, derived the inspiration for the erection of their most notable buildings; and only when this truth is kept steadily before the mind will it be possible to write a history of Byzantine vaulted architecture which shall be both scientific and consistent with the facts.

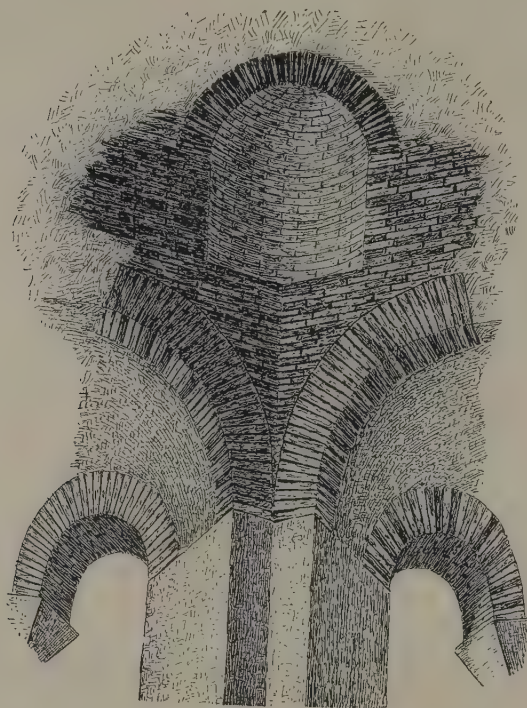


Fig. 324. S. Vitale, Ravenna. Construction of one of the pendentives of the dome



XVIII. APPENDIX

STANDING before one of the world's great domes, such as those of the Pantheon, St. Sophia, Santa Maria del Fiore, St. Peter's, the Santuario of Vicoforte, or St. Paul's, the spectator who is insufficiently acquainted with the science of construction and statics, or with the history of architecture, has little or no idea of the amount of experiment, of labour, and of genius, spread over many centuries, which have been required in order to reach the stage when these colossal structures could be erected. I will try to supply to some extent this want, treating the argument on broad and large lines.

As we have seen in the course of this book, the earliest structures of dome form had a cylindrical drum with a pseudo-vault, in some cases conical or ovoidal, in others semicircular. The vault was generally formed of simple layers of flat overhanging stones, or else of rings of masonry projecting from the drum and jutting out one beyond another. In other cases the vault is hewn out of the solid rock.

Another kind has a square (rarely an oblong) base which passes into the hemispherical pseudo-vault by means of raccords at the angles in courses projecting one beyond the other, the precursors of the triangular spherical pendentive. Exceptionally the pseudo-vault rested on rudimentary honeycomb raccords.

When the malleable concrete replaced the older method of courses of rough or worked stones in the construction of domes, it was the task of the Romans to develop, perfect, and generalize its use. And the following were the stages through which it passed, judging by the buildings which still exist or of which we have documentary evidence.

The Romans began by using concrete roofs only for round peripteral temples, such as the so-called temple of Vesta at Tivoli (first century B.C.) (fig. 325), and for the 'laconicum' of baths. This restriction was still in force in the time of Augustus (29 B.C.-A.D. 14), as we learn from Vitruvius.¹

Next they introduced it, in the form of a 'cloister-vault' gradually merging into a spherical cap towards the crown, for polygonal rooms with walls either

¹ VITRUVIUS, iv, 8; v. 10.

flat or recessed into niches, such as those we noticed in Nero's Golden House (64-68) and in the House of Augustus (81-96).

The climax was reached by Hadrian (117-138) when, probably with the assistance of his architect Decrianus, he created in the Pantheon a rotunda which,



Fig. 325. Tivoli. Temple of Vesta (first century)

among those where the dome is simply the continuation of the circular drum, had no rival, or anything near it, in the Roman world, and the organic importance of which, for those who can understand it, is greater than anything that has ever been written about it would show.

From the days of the earliest stone cupolas at least fifteen hundred years had to elapse before this wonderful building was presented to the admiration of the

world. We have to wait till the time of the Licinian emperors (253–268) for the drum of a dome to be raised on a range of semicircular recesses, as in the so-called temple of Minerva Medica at Rome. And it was not till the reign of Constantine the Great (313–337) that we find the idea of setting the drum upon a circular arcade in the Mausoleum of Santa Costanza (324–326).

Far more troublesome was the road which had to be traversed before reaching a fully developed form of dome, whether covering a square space and carried on triangular pendentives which form portions of an independent sphere, or a dome over a square or polygonal base, resting on triangular pendentives, where both pendentives and dome belong to one and the same sphere.



Fig. 326. Constantinople. St. Irene (eighth century)

The earliest examples of a circular vault of the first kind, viz. that in which the dome has a radius smaller than that of the pendentives (although these are not yet perfected, the horizontal section being almost flat instead of curved) are to be found in the Hadrianic age in the tombs known as the 'Sedia del Diavolo', and in the one near the 'Casale dei Pazzi' on the Via Nomentana outside Rome.

In a spherical form and on a very large scale, but carried on a low drum, it appears for the first time in St. Sophia at Constantinople, after the earthquake of 558. It is seen set on a high drum in St. Irene (fig. 326), soon after the earthquake of 740, where it has a diameter of about 16 m. (52 ft.) above the impost cornice, and a height of some 34 m. (110 ft.) from the floor to the crown.

Domes of the second kind, that is to say with a continuous intrados, appear, though in a still indefinite form, in the time of Septimius Severus and Caracalla (193–217). The Baths of Caracalla at Rome contain a notable example (p. 172). In its developed form we find it from the fifth century onwards in the tomb of Galla Placidia and the baptistery of Neon at Ravenna.

It appears, then, that the process by which the dome resting on triangular



Fig. 327. Chiaravalle Milanese. Campanile (thirteenth century)

pendentives was evolved took more than a thousand years to pass from the undeveloped to the intermediate stage, and afterwards from two to four centuries elapsed before it reached perfection. During the period of the evolution of the dome set on spherical pendentives there were discovered and developed the Romano-Ravennate niche-pendentive and the Romano-Campanian conical vaulted or hood-shaped form. The former was merely the result of lifting (as was done by Julianus Argentarius) the angle recesses of a room in the House of Augustus on to the main arches of San Vitale at Ravenna (526-547). The latter, on the other hand, appears in an elementary form as a sort of squinch in the large Baths of Hadrian's Villa at Tivoli (125-135), and reached completion in San Giovanni in Fonte at Naples (fifth century), where the square passes into the octagon at the base of the dome by means of four hood-shaped niches.

At a later date the Lombard gilds set to work to devise for their octagonal cupolas a pendentive of this kind, easy of construction, having a compound form, sometimes with numerous orders, as in the tower-cupola of the abbey church of Chiaravalle Milanese (fig. 328). This notable elliptical cupola, surmounted by the campanile required by the Cistercian rule, dates from the end of the thirteenth century¹ (fig. 327). This type, found in germ in Hadrian's Baths, as mentioned above (p. 136), and in process of transformation in the baptistery at Biella (tenth century) (fig. 329),² reached completion in the eleventh century, thus taking nearly a thousand years in the process.

Of spherical pendentives the kind which is continuous with the dome is the simplest and most pleasing. The other kind is more difficult of execution and not so graceful. Apart from this, it has the advantage of forming a support for a service-gallery at the base of the drum. From the statical point of view both are superior to the niche or hood-shaped pendentive, for the weight which they have to carry is gradually distributed by them on the impost arches, instead of being concentrated on fixed points in those arches.

We will now pass in review the great domes mentioned at the beginning of this appendix. Of the essential features and surpassing merits of the dome of the Pantheon I have already said enough in my account of Hadrian's buildings.

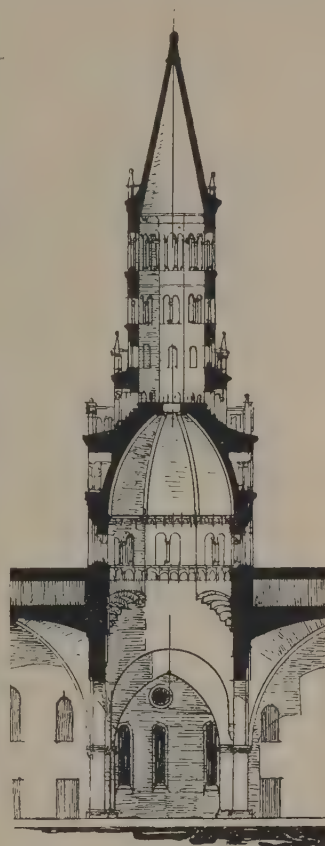


Fig. 328. Chiaravalle Milanese. Section of the tower (from *Rassegna d'Arte*, xix, p. 45, fig. 11)

¹ M. CAFFI, *Dell' Abbazia di Chiaravalle in Lombardia*, pp. 10, 47, 48.

² [RIVIERA, *Lombardic Architecture*, vol. i, pp. 178-180.]

DOME OF ST. SOPHIA AT CONSTANTINOPLE (figs. 330, 331)

The precise form of Justinian's original central vault (532-537) is not known, but by inference (communicated to me in 1900) from a careful examination of one of the great piers by Sig. D'Aronco, the architect who had charge of the restoration, it must have been depressed, like the two half-domes between which it is set ; and the four zones from which it sprang, and which formed its support, consisted of horizontal courses of brick.

The fact remains, nevertheless, that two eminent architects, Anthemius and the elder Isidorus, were unable to guarantee its stability, for it collapsed in the earth-

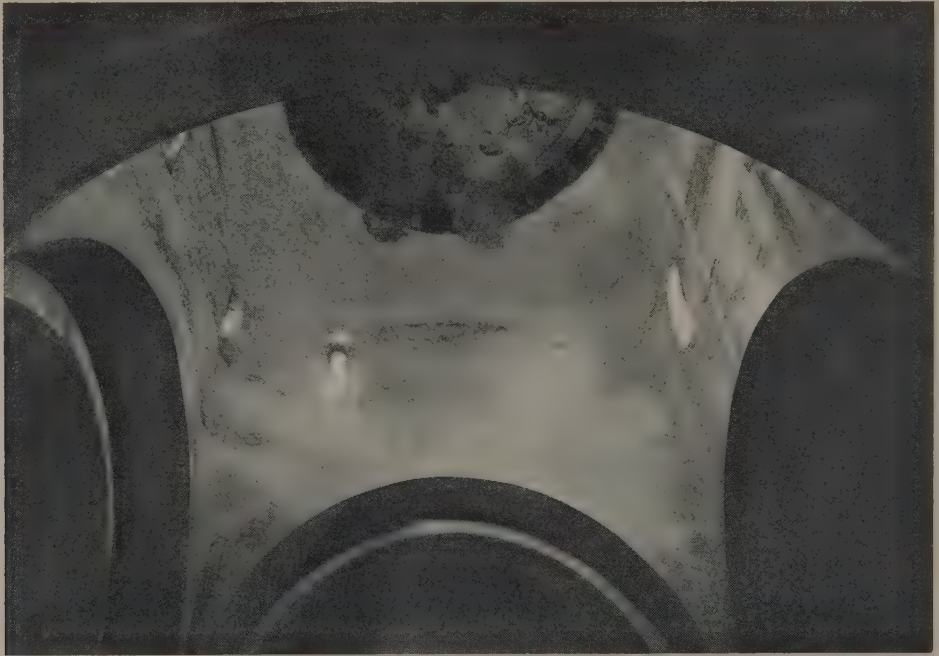


Fig. 329. Biella. Interior of Baptistry showing compound pendentives

quake of 558. Theophanes (758-818) says that the architects attributed the disaster to the defective construction of the great supporting piers, the result of economy ;¹ and Agathias (536-582) records that the younger Isidorus and the master builders ascertained the defect in construction, and identified the exact spot where it occurred.² The cause of the catastrophe may also have to be sought in the fact that this dome was the first work of the kind on so vast a scale carried out by Eastern builders (from Isauria³), who had not got, like the Romans, a deeply rooted ancient tradition of vault-construction on a grand scale. With this one exception, the Byzantines never erected domes of great span in solid materials.

It was thanks to the powerful brain of the younger Isidorus that the dome was reconstructed between 558 and 563, with such increase of reinforcement as should enable it to defy, which it has done, other not less severe earth-movements. The

¹ *Corpus Script. Hist. Byz.*, THEOPHANES, *Chronographia*, vol. i, pp. 359, 360.

² *Ibid.*, AGATHIAS, v, 9.

³ *Ibid.*, THEOPHANES, vol. i, pp. 359, 360.



Fig. 330. Constantinople. Exterior of St. Sophia (532-537)



Fig. 331. Interior of St. Sophia (532-537)



Fig. 332. Florence. Santa Maria del Fiore (1357-1471)

diameter at the impost cornice is 33.60 m. (about 110 ft.), and the height is 56 m. (182 ft.) from the crown to the floor. Its want of elevation, which goes so badly with its great span, together with the dwarfing of the drum, produce in the interior such a heavy effect that it seems as if it were about to fall on the spectator's head.¹

¹ [JACKSON, *Byzantine and Romanesque Architecture*, vol. i, p. 100 (quoting C. R. Cockerell).]



Fig. 333. Parma. Dome of the Cathedral (eleventh and twelfth centuries)

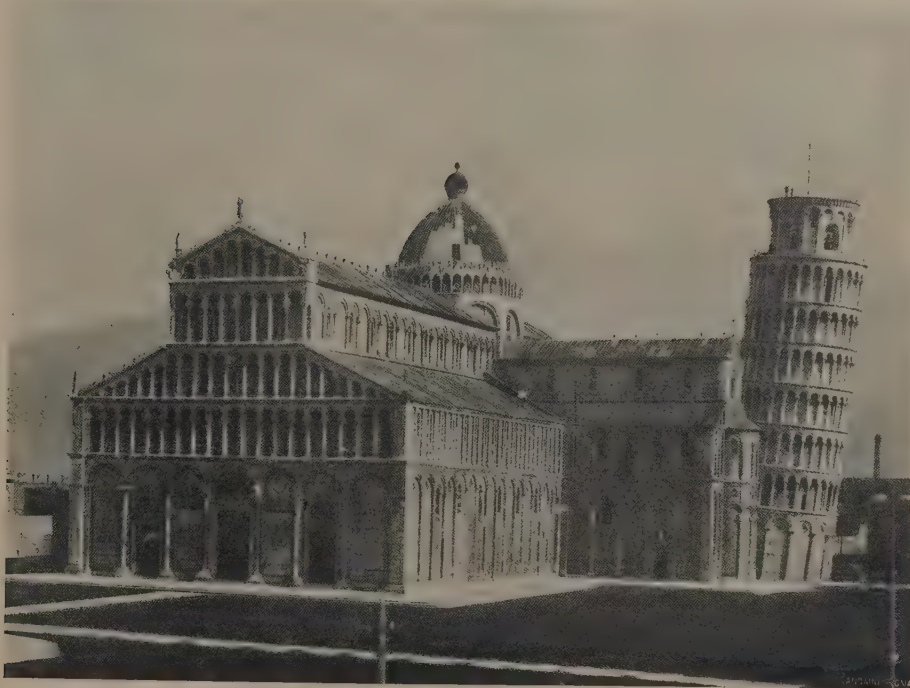


Fig. 334. Pisa. Dome of the Cathedral (eleventh and twelfth centuries)

DOME OF SANTA MARIA DEL FIORE AT FLORENCE (fig. 332)

The Cathedral of Florence dates from 1296, but was rebuilt on a new plan in 1357. The dome was begun in 1420 from the designs of Brunelleschi (1377–1446), and was finished up to the lantern in 1434. The latter was begun in 1445 from the design of the same architect, and finished in 1461, the last touches being added in 1471.¹ The extent of space which it covers—42.20 m. (about 138 ft.) between the opposite internal faces; its great height—88.90 m. (about 290 ft.)



Fig. 335. Milan. Dome of Sant' Ambrogio (eleventh–thirteenth centuries)

from the floor to the base of the lantern; and the fact that it was the first instance of a double shell of masonry, caused it to be regarded as a wonderful achievement; and both the architect and his work soon became famous. Flavio Biondo (1392–1463), who saw it while it was building, refers to the 'basilica insignis, quae per nostram aetatem curante Philippo Brunalicio nobilissimi ingenii Florentino stupendi operis fornice est ornata'.² Like the dome of the Pantheon, it inspired Michelangelo for the dome of St. Peter's, while he avoided the faults of either.³ And though, in bulk, shape, and construction, there are various differences between the cupolas of Santa Maria del Fiore and St. Peter's, there are also many resemblances.⁴

The choice of an elongated curve in preference to a hemispherical one was due more to the question of means than to constructional artistic reasons.⁵ The device of a double vault had, according to its author, the objects of preserving the internal one from damp, and of producing an effect of greater magnificence and amplitude.⁶

¹ CAVALLUCCI, *Santa Maria del Fiore*, pp. 1–85. GUASTI, *La cupola di Santa Maria del Fiore*, pp. 9–115.

² FLAVIO BIONDO, *Italia illustrata*, p. 304.

³ C. FONTANA, *Templum Vaticanum et ipsius*

origo, pp. 315, 316.

⁴ POLENI, *Memorie storiche della gran cupola del Tempio Vaticano*, col. 104.

⁵ CAVALLUCCI, *op. cit.*, pp. 72–4.

⁶ GUASTI, *op. cit.*, p. 29.

teenth centuries) is barely 13 m. (43 ft.) (fig. 333). That of the cathedral of Parma (fig. 334) (eleventh and twelfth centuries) is only 11.20 m. (about 37 ft.). In the cathedral of Pisa (fig. 335), the longer axis of the elliptical-based, two-centered, and conical-shaped dome resting on Campano-Lombardic pendentives (begun in 1063 and finished as a whole about the middle of the twelfth century),¹ measures only 16.30 m. (53 ft.). Nor were they remarkable for height. In the instances just mentioned of San Vitale, Sant'Ambrogio, and the cathedrals of Parma and Pisa, the height of the apex from the floor is, respectively, in metres : 29 (95 ft.), 28.35 (93 ft.), 39.20 (128 ft.), and 47.50 (153 ft.).



Fig. 336. Jerusalem. The Dome of the Rock or Mosque of Omar (seventh-twelfth centuries)

Still less had they been provided with a double shell. This type of roof had its origin in the East, where at first it was used in the form of a cupola of timber strengthened by stout ribs, also of wood, kept in place by iron rods, as I have shown elsewhere.² It is illustrated by the Dome of the Rock or Qubbat as-Sakrah at Jerusalem, commonly called the Mosque of Omar (between 687 and 691) (fig. 336), rebuilt in the form we now see between 1020 and 1035, after the destruction of the first one in the earthquake of 1016; by the 'Anastasis' of the Holy Sepulchre at Jerusalem (between 813 and 833); and by the Mosque of Walid at Damascus (1082).

It remained for Brunelleschi to construct one, not of wood but of masonry. The only feature retained from the Eastern domes just mentioned (which may

¹ *Memorie della R. Accademia di scienze dell' Istituto di Bologna*, ser. i, vol. vii, pp. 95-116; viii, pp. 15-21, SUPINO, *La costruzione del Duomo*

di Pisa.

² RIVOIRA, *Moslem Architecture*, pp. 47, 58, 59, 80, 81.

have given Brunelleschi his first suggestion) is the use of ribs in a simple form, here developed and carried out in a grandly conceived and scientific way, different both in intention and manner from the other. This system, which was clearly indicated by its inventor,¹ is represented by twenty-four ribs or spurs of which the eight principal ones are set at the angles, and the sixteen smaller ones along the sides, all being pierced by openings for communication. Starting from the spring of the two vaults which form the dome, they rise in a pyramidal way contracting as they approach the crown, thus tying together and strengthening



Fig. 337. Florence. The Baptistery—San Giovanni (eleventh century)

the two vaults, as well as supporting the lantern. From each angle of the internal vault spring nine horizontal arches or small vaults, which support the outer vault. There is besides a framework of stout beams.

This system was based on Brunelleschi's study of the Roman principles of radial ribs in domes, and of the device of the chambers connecting the attic of the outer drum of the Pantheon with its great dome with the object of strengthening it. He also made use of the elements and lessons to be found in medieval buildings before his time. Above all, we may be sure, he had before him the Baptistery of San Giovanni at Florence (figs. 337, 338).

It has been suggested that the statical and constructive design of the Baptistery, which was erected in the years immediately preceding its consecration by Pope

¹ GUASTI, *op. cit.*, pp. 28-30.

Nicholas II (1059-1061) in 1059¹, was imitated by Brunelleschi in the dome of the cathedral of Florence.² On the contrary, in spite of various points of contact which may be noticed in the two buildings, the differences which separate them are substantial, as has been demonstrated before now by others.³

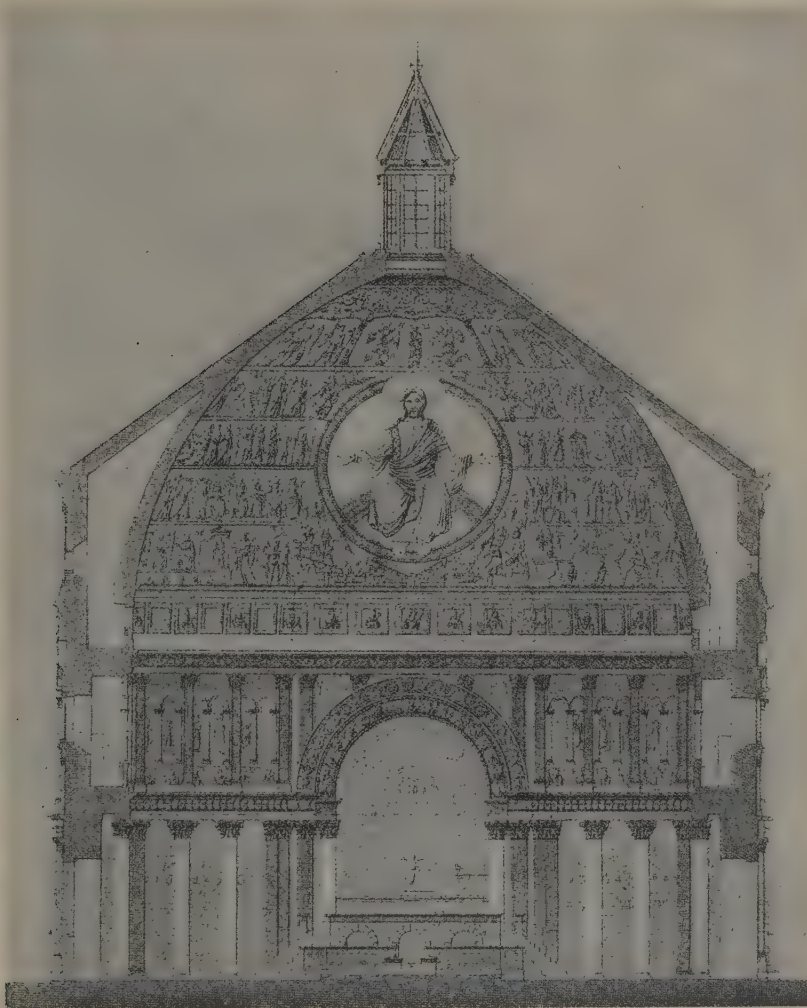


Fig. 338. Section of the Baptistery, Florence. (From ISABELLE)

Any one who would examine on the spot the dome of Santa Maria del Fiore, and study the means devised for securing its stability, for concentrating the vertical pressure on the main piers, and neutralizing the oblique thrust, should remember

¹ NARDINI DESPOTTI MOSPIGNOTTI, *Il Duomo di San Giovanni oggi Battistero di Firenze*, pp. 83, 108. RIVOIRA, *Lombardic Architecture*, vol. ii, pp. 69, 70.

² NARDINI DESPOTTI MOSPIGNOTTI, *op. cit.*,

pp. 9-11, 124-7.

³ *Annali d'ingegneria e di architettura*, 1918. G. B. MILANI, *Il sentimento dell'architettura latina e la cupola di S. Giovanni in Firenze*.

that it was constructed without the aid of centering, and had to bear the weight of a lantern of considerable size at that great elevation. It will then be realized what a wonderful achievement it was for a first experiment in its kind. From it Michelangelo got the model for his dome of St. Peter's, though he gave it a spherical shape, and thus obtained a more satisfactory contour both inside and



Fig. 339. The Dome of St. Peter's (1506-1591). (From the Vatican Gardens)

out. He also avoided its defects of lighting, and so brought his dome to perfection.

Eight centuries had to elapse from the appearance of the first double cupola before Brunelleschi's supreme achievement was reached.

THE DOME OF ST. PETER'S AT ROME

The erection of the existing Vatican Basilica (fig. 339) was begun in 1506 by Julius II (1503-1513), with Bramante (1444-1514) for architect, whom tradition credits with the daring design of setting the Pantheon upon the huge arches of Constantine's 'Basilica Nova'. Whether the plan was to be that of an equal- or

unequal-armed cross is not quite certain, for the preliminary sketches by Bramante and his assistant, Baldassare Peruzzi (1480-1536), that we have, include both forms; but it seems that the architect regarded the first as most suitable under the circumstances. The 'Latin cross' plan, which appears in a scene painted on the dado of the Hall of Constantine in the Vatican, representing the inspection by the Pope of the plans for St. Peter's, is supposed to have been suggested by Raphael.¹ The annexed illustration shows Bramante's design as it appears on a medal struck by order of Julius II when the first stone was laid (figs. 340, 341).

Even while Bramante was alive Giuliano da Sangallo (1452-1516) and Fra Giocondo (1435-1515) had been appointed his assistants, and they continued to work in concert with Raphael when, on the death of Bramante (1514), he was made first master of the works. It is known that Giuliano and Fra Giocondo were in favour of the Latin cross plan. We have no drawing by Raphael's own hand throwing any light on the question.



Figs. 340, 341. Medal of Julius II (1506) showing Bramante's design for St. Peter's

After Raphael's death (1520), the younger Antonio da Sangallo (1483-1545) succeeded him as director of the works, with Baldassare Peruzzi for assistant. His model, executed by his pupil Antonio Labacco, is well known (figs. 342, 343). The niggardly administration of Hadrian VI (1522-1523), political unrest, the horrible sack of Rome in 1527, want of money, Sangallo's engagements on other important buildings, were all causes of delay and interruption in the works, so that on his death the basilica presented a whole of undecided character, with no part satisfactorily finished.

In 1546 Paul III (1534-1550) summoned the sovereign intellect of Michelangelo (1474-1564) to take charge of the great enterprise. He discarded much of Sangallo's too elaborate and theatrical design, in which the tribunes would have had clumsy lunette windows of three lights (like those e.g. in the Baths of Diocletian) and the dome would have been inadequately and badly lighted. He went back to the plan of a simple square cross (if we are to trust the drawing, believed to be the original one, preserved in the Capitular Archives of the Basilica) in order to reduce the expense and give greater importance to the dome, for which he designed a double vault and curve of rather more than a semicircle. Instead of resting on arches, as originally intended, it was to be set on a complete cylinder.

¹ VON GEYMÜLLER, *Die ursprünglichen Entwürfe für Sanct Peter in Rom*, pp. 12-14, 220-83, 345, 346.

The work, which dragged on under continual and bitter persecutions and vexations—the jealousy of artists is as old as art itself—had reached the top of the drum when Michelangelo was removed by death.



Fig. 342. Vatican Basilica: Antonio Sangallo the younger's model for St. Peter's

The drum remained without its essential complement¹ till Sixtus V (1585–1590) entrusted the construction of the dome to Giacomo della Porta (1541–1604), together with the architect-engineer Domenico Fontana (1543–1607). It was carried out with some slight variation from Michelangelo's wooden model (figs. 344 and 345 illustrate it and the version of Della Porta and Fontana); that is to

¹ [Contemporary prints showing the drum without the dome are reproduced in Dr. ASHBY'S *Topographical Study in Rome in 1581* (Roxburghe Club, 1916), pls. 11 and 13; A. S.

BARNES, *St. Peter in Rome*, pp. 286, 300; LANCIANI, *Pagan and Christian Rome*, p. 146 (from CIAMPINI, *De Sacris Aedificiis*, tab. xii).]

say both the inner and outer vaults were raised, thus producing a more animated and graceful curve, as well as surpassing in height every existing dome. The new



Fig. 343. Antonio Sangallo's model for St. Peter's. The dome

design was cut in outline on the pavement of the basilica of St. Paul's without the walls.¹

The two architects, being obliged to increase the weight of the dome, employed

¹ C. FONTANA, *Templum Vaticanum et ipsius origo*, pp. 249, 250, 315-38. GILLII, *Architettura della Basilica di S. Pietro in Vaticano*, p. iv.

VON GEYMÜLLER, *op. cit.*, pp. 263-8, 275-7, 283-303, 315-23. MERZARIO, *I maestri Comacini*, vol. ii, pp. 437-54.

a contour which, according to Poleni (1683-1761), varies but little from a catenary curve. This, when inverted, makes an arch or vault in which all the parts support one another mutually by their own weight without the help of mortar. In practice it can be exactly represented by a chain which is flexible throughout, and cannot be either lengthened or shortened ¹ (fig. 346).

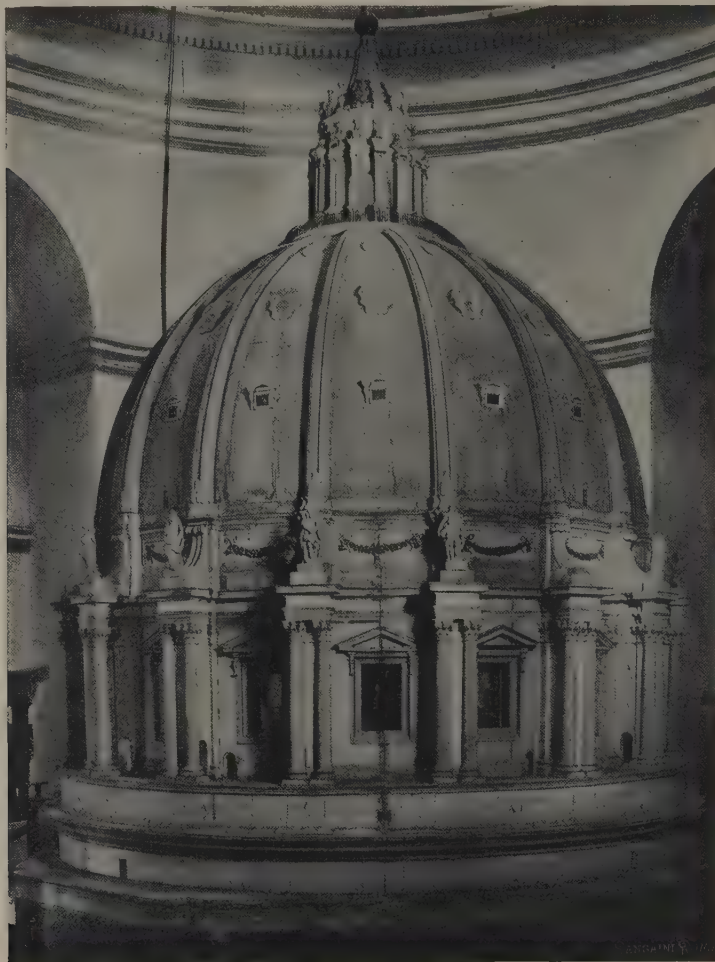


Fig. 344. Michelangelo's model for the dome of St. Peter's

It was in 1588 that the construction of the dome was begun, following Michelangelo's design, as modified in this way ; and it was completed in 1590, the lantern being finished in 1591. The result was a creation which has no rival in the world.

The principle on which the dome is constructed is as follows. The wall where the spring begins is the continuation of the drum, and it curves over as it rises, gradually increasing in thickness up to the point of greatest expansion, or

¹ POLENI, *Memorie istoriche della gran cupola del tempio Vaticano*, cols. 30-50.

part where the dome exercises its greatest thrust. Here it is divided into three parts, the outer and inner ones being the two vaults which form the cupola, while



Fig. 345. Michelangelo's model for the dome of St. Peter's,
showing interior

the space between is for ventilation and communication. From the same point begin sixteen cross-walls (*diaframmi*) inclining towards the lantern opening, pierced with arched passages for communication; and from them start two sets of sixteen panels or webs following the general curve. These form respectively

the inner and outer vaults of the dome. At the point of greatest thickness or expansion of the inner shell are three great iron bands¹ going all round, intended to resist the lateral thrust and keep everything firm. In order to give more elegance and variety to the exterior, at first it had ribs of copper gilt, later replaced in lead, though not in every case, for a few of the others were found when the lead roof was renewed between 1869 and 1886. Between them are inserted the windows which light the space within. C. Fontana describes the way in which the centerings were constructed.²

The same writer is quite justified in his admiration for the wonderful skill displayed in this masterpiece of modern architecture, in which Michelangelo had by sound and legitimate methods welded forty-nine separate sections of masonry, united by the force of gravitation, into a single body.³

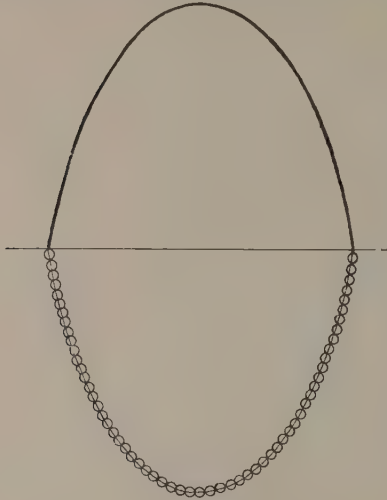


Fig. 346. Catenary curve

The internal diameter of the dome is 42.50 m. (about 138 ft.), while the crown is 101 m. (about 330 ft.) above the floor of the basilica, and the vault of the lantern 117.80 m. (over 380 ft.). Thanks to the numerous large windows in the drum, and also to the circular opening at the top, which is 7.35 m. (24 ft.) across, the dome is better lighted than any other part of the church.

Before entering upon his daring enterprise, Michelangelo had examined the foundations in order to assure himself that they were properly constructed and intact, and had also tested the stability of the four great piers (the core of each being quite 71.30 m. (232 ft.) in circumference) which support the arches designed to carry most of the weight of the structure above, and made provision for this object.⁴ This was a wise precaution, in view of the works carried out by his

predecessors. Because Bernini (1598–1680) did not trouble to do the same thing before he began the erection of the first of the two bell-towers on the front of Maderno's (1556–1629) prolongation of the basilica, his work had to be pulled down. In this way the huge organism, which might have caused great anxiety, was able to settle without any signs of movement appearing in the foundations or the piers, and with merely a few slight flaws in the great arches.⁵ But though the process of settlement seems not to have caused anything more than the crack noticed by Carlo Fontana in the drum and internal dome,⁶ the inspection of 1743 revealed in some parts (the causes being not entirely ascertained or ascertainable) deviations from the perpendicular and sundry fissures going through the thickness of the walls, as well as minor openings or cracks, and the fracture of one of the great iron bands.⁷ The remedies devised and carried out in consequence deserve the attention of

¹ [These bands (*cerchioni*) consist of horizontal bars linked at either end to the next ones.]

² Op. cit., p. 321.

³ Op. cit., pp. 315–18.

⁴ VASARI, *Vite* (ed. G. Milanesi), vol. vii, pp. 220–2.

⁵ POLENI, op. cit., col. 135, 136, 324.

⁶ Op. cit., p. 354.

⁷ POLENI, op. cit., cols. 324–5, 425–48.

experts, who perhaps may be called upon to ascertain and, if necessary, to make good defects which have occurred in other domes of great size.

Starting from the wide but single dome of St. Sophia with its spherical pendentives, it took a thousand years and the work of master minds, one of whom, Michelangelo, may be almost described as inspired, in order to attain the vast double dome of St. Peter's with its similar pendentives.

St. Peter's was the first double dome to be erected in Rome. It might be thought that of Santa Maria di Loreto by the Forum of Trajan was earlier. Vasari (1512-1574) writes that when the church was built, Antonio Sangallo the younger completed it and gave the finishing touches.¹ Carlo Fontana says that the first idea came from Bramante; that it was carried out by Andrea Sansuini, and completed by Antonio Sangallo, the lantern being the work of Giacomo del Duca, a pupil of Michelangelo's.² Milizia (1725-1798) states that it was the younger Antonio da Sangallo's first work in Rome, and that the Sicilian Giacomo del Duca (born 1520, still alive in 1594)³ erected the inner lantern.⁴ Nibby dates its erection by Sangallo in 1507, and its completion in 1580,⁵ so that the existing double dome would be the one designed by Sangallo. A different account is given by Clausse, who believes the dome to have been designed by Giuliano da Sangallo, begun in 1507, carried on and finished (with a single dome lighted by a circular opening at the crown) by his nephew Antonio: then, between 1590 and 1592, the architect Giacomo del Duca covered the original dome with the present outer one, and erected the lantern.⁶

But to an expert, who takes the trouble to go up into the dome, as I have done, it reveals its true story, which is not the one hitherto given to the world. This



Fig. 347. Rome. S. Maria di Loreto. Elevation and section. (From G. DE ROSSI)

¹ VASARI, vol. x, p. 248.

² Op. cit., p. 361.

³ R. ALBERTI, *Origine et progresso dell' Accademia del disegno, de pittori, scultori, et architetti di Roma*.

⁴ MILIZIA, *Memorie degli architetti antichi e moderni*, vol. i, pp. 251, 341.

⁵ NIBBY, *Roma Moderna*, i, p. 378.

⁶ CLAUSSE, *Les San Gallo*, vol. ii, pp. 46-66.



Fig. 348. Mondovì. The Santuario of Vicoforte (1596-1733). West front

story is as follows, and it is partly corroborated by documents preserved in the archives of the Sodalizio dei Fornari Italiani or Bakers' Company.

The original octagonal dome, whether designed or not by the younger Sangallo, certainly carried out by him, was single, and was surmounted by the small lantern

cupola which still lights the interior. By way of increasing the effect, an alteration was made later, by creating outside and around it the second dome resting on the lantern cupola; and this dome was finished in 1577 from the designs of 'Jacobo scultore ciciliano', in other words Giacomo del Duca, and under the supervision of the master-builder Domenico Finocchi, who has left a record of himself in an inscription built into the inner face. The new outer dome remained without its



Fig. 349. The dome of the Santuario of Vicoforte

new lantern cupola (really a sham lantern, as there was no 'eye' or opening in its base, and so erected merely for a constructional and decorative purpose) until 1585,¹ in which year it is known to have been constructed, thanks to a legacy of 1580. Therefore the outer dome, as well as the sham lantern, must be assigned to Giacomo del Duca. A drawing by Giacomo de Rossi, engraved in 1684,² shows the alterations for which he was responsible (fig. 347).

¹ [The unfinished dome is shown in Du Pérac's *Vestigi* (1575), pl. 33, reproduced by Dr. Ashby in *Topographical Study in Rome in 1581* (Roxburghe Club, 1916), pl. 36, pp. 118,

119, and pl. xxviii.]

² GIACOMO DE ROSSI, *Insignium Romae templorum prospectus exteriores interioresque a celebrioribus architectis inventi*, fol. 61.

DOME OF THE SANTUARIO DI NOSTRA SIGNORA DI VICOFORTE NEAR
MONDOVÌ (fig. 348)

The Santuario of Vicoforte was begun by Charles Emmanuel I of Savoy (1562–1630) in 1596, from the designs of Ascanio Vitozzi (1539–1615), with the idea that it should also serve as a mausoleum for the House of Savoy. At the death of that great prince the structure had barely reached a quarter of its height, and in 1728 the work had only got as far as the great internal cornice, in other words the base of the drum.

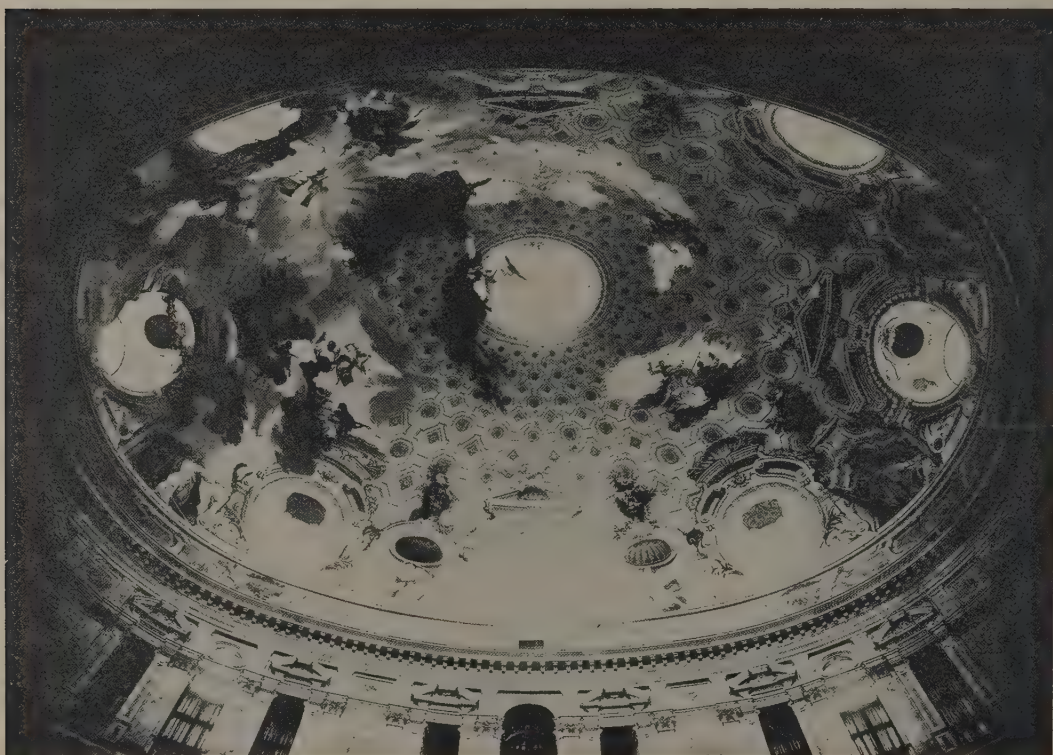


Fig. 350. Santuario of Vicoforte. Interior of the dome

It was the eminent architect and engineer Francesco Gallo (1672–1750), a true representative of the Roman State architects, who took in hand its completion with his own plans, the Cistercians having deliberately destroyed Vitozzi's wood model and designs. The masonry work was begun in 1729, the drum was finished in 1730, the dome was constructed in 1731, and in 1733 the lantern was erected.¹

The elliptical dome (fig. 349), a half-ellipsoid with triple axis, measures at the horizontal axes 36.25 m. (118 ft.) and 24.10 m. (79 ft.) respectively, and at the vertical one 16 m. (52 ft.). The height is 49.60 m. (162 ft.) from the level of the

¹ DANNA, CHIECCHIO, *Storia artistica illustrata del Santuario di Mondovì presso Vicoforte*, pp. 1–298. MELANO ROSSI, *The Santuario of the*

Madonna di Vico, Pantheon of Charles Emanuel I of Savoy, pp. 35–59.

pavement. Its construction was a very difficult task on account of the centering, having regard to the form of the intrados which made it necessary to plan and set out every section separately, whereas a single form suffices in the case of the

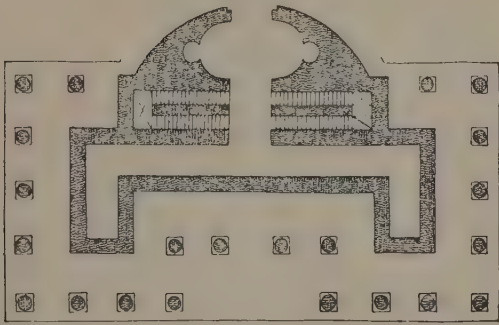


Fig. 351. Oval chamber with elliptical vault
(From MONTANO, *Scielta*, tav. 28)

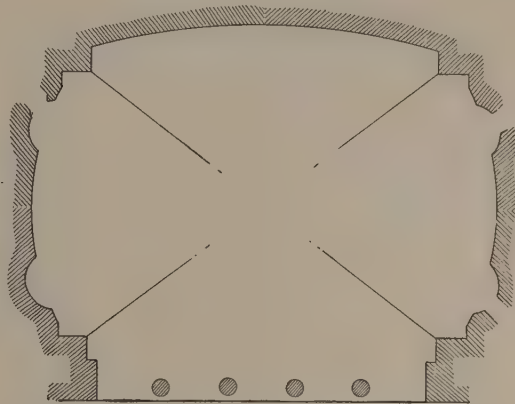


Fig. 352. Thermae of Caracalla. Plan of oval chamber

centerings for spherical and cloister vaults. Moreover, an outer covering had to be provided in which the radius of the curve changes from point to point. In order to secure it from the considerable thrusts, it was strengthened by raising the drum as high as the point where the curve was most marked, and on the outside by massive buttresses. It was covered with a lead roof resting on a framework of timber, with an interval between it and the extrados in order to provide a space for circulation.

The exterior view of the dome, owing to the raising of the drum and the profile of the curve, may not be very satisfactory, but inside the effect is harmonious and impressive (fig. 350). In size it comes fourth after the domes of the Pantheon, the cathedral of Florence, and St. Peter's. Of its particular form it is the largest in the world.

There are those who go out of their way to search for the origins of this type of dome in the East, and particularly in St. Sophia, while they might have found them with less trouble and greater success in Italy, for instance in that inexhaustible mine of instruction and suggestion provided by the buildings of ancient Rome, or, again, by the Roman tombs of the Imperial age. Montano has an illustration, very much to the point, of one of oval shape inside with an elliptical



Fig. 353. Elevation of oval chamber in the
Thermae of Caracalla

vault¹ (fig. 351). In our account of the Baths of Diocletian we noticed the Roman buildings which Anthemius had in mind for the plan of St. Sophia (p. 207). For the plan of the Santuario of Vicoforte Vitozzi in his turn could go to the Pantheon, that perennial source of inspiration for architects, with its great recesses set round the



Fig. 354. Rome. S. Giacomo degl' Incurabili. Buttressing of the Dome

circumference, to which he added the characteristic Roman vestibule with an apse at either end, lengthened the chancel or tribune, and converted a circular into an oval rotunda. The latter may have been due to a desire for novelty, or to the conditions of the site,² or it may have been copied directly from the church of San Giacomo in Augusta at Rome. If we look for a prototype of Vitozzi's elliptical dome, in the Baths of Caracalla (212-216) the two last rooms but one at the ends of the west

¹ MONTANO, *Scielta*, &c., tav. 28 (from the copy in the Barberini Collection in the Vatican

Library).

² DANNA, *Chiecchio*, op. cit., p. 48.

front of the central block, measuring 28 m. $\times$ 21.70 (about 92 $\times$ 72 ft.), were roofed by two half-domes at the opposite ends connected by a cross-vault. In the north-west room the half-domes are still in existence, and also the springers of the groins of the cross-vault (figs. 352, 353). Moreover, in the *Thermae* of Agrippa as rebuilt by Hadrian (120-124), in those of Trajan (117), and of Diocletian (305), we find elliptical rooms with *exedras* at either end connected by a barrel- or cross-vault.¹

The dome of Vicoforte has nothing in common with the modest oval cupola



Fig. 355. Rome. Dome of S. Giacomo degl' Incurabili (1600)

of Sant' Andrea on the Via Flaminia near Rome, a little church of rectangular plan, the internal dimensions being barely 10 m. $\times$ 7.90 (32½ $\times$ 26 ft.). It was built by Barozzi da Vignola (1507-1573) for Julius III (1550-1555), and has been severely criticized by Milizia,² as the dome is supported on triangular spherical pendentives instead of being a continuation of the drum. On the other hand it is related to San Giacomo in Augusta or 'degl' Incurabili' in Rome, built by Cardinal Salviati (1537-1602) from the designs of Francesco Ricciarelli of Volterra (d. 1588), and finished in 1600 (as we know from two stones built into the walls) by Maderno, who also designed the façade.³ It seems, then, that Francesco of

¹ BERTOTTI, SCAMOZZI, *Le Terme di Roma disegnate da A. Palladio*, tavv. i, vii, xi.

² Op. cit., vol. ii, pp. 71, 175.

³ Ibid. G. DE ROSSI, op. cit., fol. 59, 60. ARMELLINI, *Le chiese di Roma*, p. 324.

Volterra must have the credit of being the first to erect a good-sized church of oval plan with a semi-elliptical dome.

Here the entrance arch and the sanctuary are set on the longer diameter of 22 m. (72 ft.), and six chapels on the smaller one of 17.35 m. (57 ft.). The exterior of the drum is surmounted by an attic in which are oval openings to light and ventilate the roof. It is supported by enormous buttresses like inverted consoles, which are prolonged in the lighter form of square pilasters up to the top of the attic (fig. 354). The dome, in which the crown of the intrados is 27.80 m. (about 90 ft.) above the floor, has its own base pierced by large rectangular arched windows, producing a series of lunettes inside (fig. 355). It is covered by a gabled roof, with the ends of the four tie beams resting each on two opposite piers raised above the party walls of the chapels below, and strengthened outside by the square pilasters described above. The massive buttressing employed and the use of an independent roof, so as not to lay any unnecessary weight on the vault, reveal the architect's anxiety about insuring the stability of his new form of structure; it being well known that the more the curve of a vault departs from the vertical, the greater is the thrust.

San Giacomo degl' Incurabili was followed in 1676 by Sant' Andrea al Quirinale, built by Camillo Pamfili, nephew of Innocent X (1644-1655), from the designs of Bernini.¹ The plan measures 25.80 m. $\times$ 16.25 (84 $\times$ 52 ft.). The elliptical dome is 10 m. (33 ft.) high, and the opening at its summit is 25.80 m. (84 ft.) above the floor of the church. It is crowned by a small oval lantern. The lead covering rests directly on the extrados. The drum, pierced with arched windows below the start of the dome, is supported outside by stout console-shaped buttresses which are carried higher than the haunches of the dome up to the top of the wall in the form of square pilasters. The substantial nature of these adjuncts and counterpoises was due to the very considerable oblique thrust produced by a vault of this kind.

THE DOME OF ST. PAUL'S CATHEDRAL, LONDON (fig. 356).²

After the irreparable injuries suffered by the cathedral in the Great Fire which ravaged the City in 1666, Wren (1632-1723) was entrusted with the task of rebuilding it.

Among the proposals set out by the great architect is one, approved by Charles II (1660-1685), which shows a dome surmounted by a fantastic superstructure formed by six retreating stages, with blank arcades and balcony, on the highest of which stands the cross supported by three balls.³

The new building was begun in 1675 and finished in 1710. The drum of the dome rests on eight great arches and the same number of spherical pendentives, supported by as many piers (fig. 357). It is pierced by a series of rectangular windows in threes. The internal dome is of brick, with a diameter of 31 m. (102 ft.) and its apex is 68.55 m. (223 ft.) above the floor. The external dome, which is independent of the other, is a false dome of timber set on the attic of the wall

¹ G. DE ROSSI, op. cit., fols. 24, 25. MILIZIA, op. cit., vol. ii, p. 268. NATALI, *Storia dell'Arte*, vol. iii, p. 13.

² [This section is obviously a mere fragment, which the author had only begun to sketch out.

It was, however, thought best to print it as a fitting conclusion to the Appendix.]

³ Oxford, All Souls' College Library, SIR CHRISTOPHER WREN'S *original drawings*, vol. i, nos. 9-14.



Fig. 356. London. The dome of St. Paul's (1675-1710)

supporting the internal dome, and rises, including the lantern and cross, to a height of 111 m. (360 ft.) above the pavement (fig. 358).¹ The considerable difference in the height of the two domes means that there is a want of co-operation between them. Hence the exterior has an impressive and graceful effect, while the interior

¹ [The lantern, of course, rests on the brick cone which rises between the two domes.]



Fig. 357. Piers of the dome, St. Paul's

appears unsatisfactory to the eye, a defect which is aggravated by the scanty and insufficient lighting.

The dome of St. Paul's, a combination of the Eastern double dome of wood and the Italian double dome of solid materials, was the first of its kind. I cannot say whether the selection of this form was due to want of funds. A real double dome of this size would have required very expensive masonry supports.

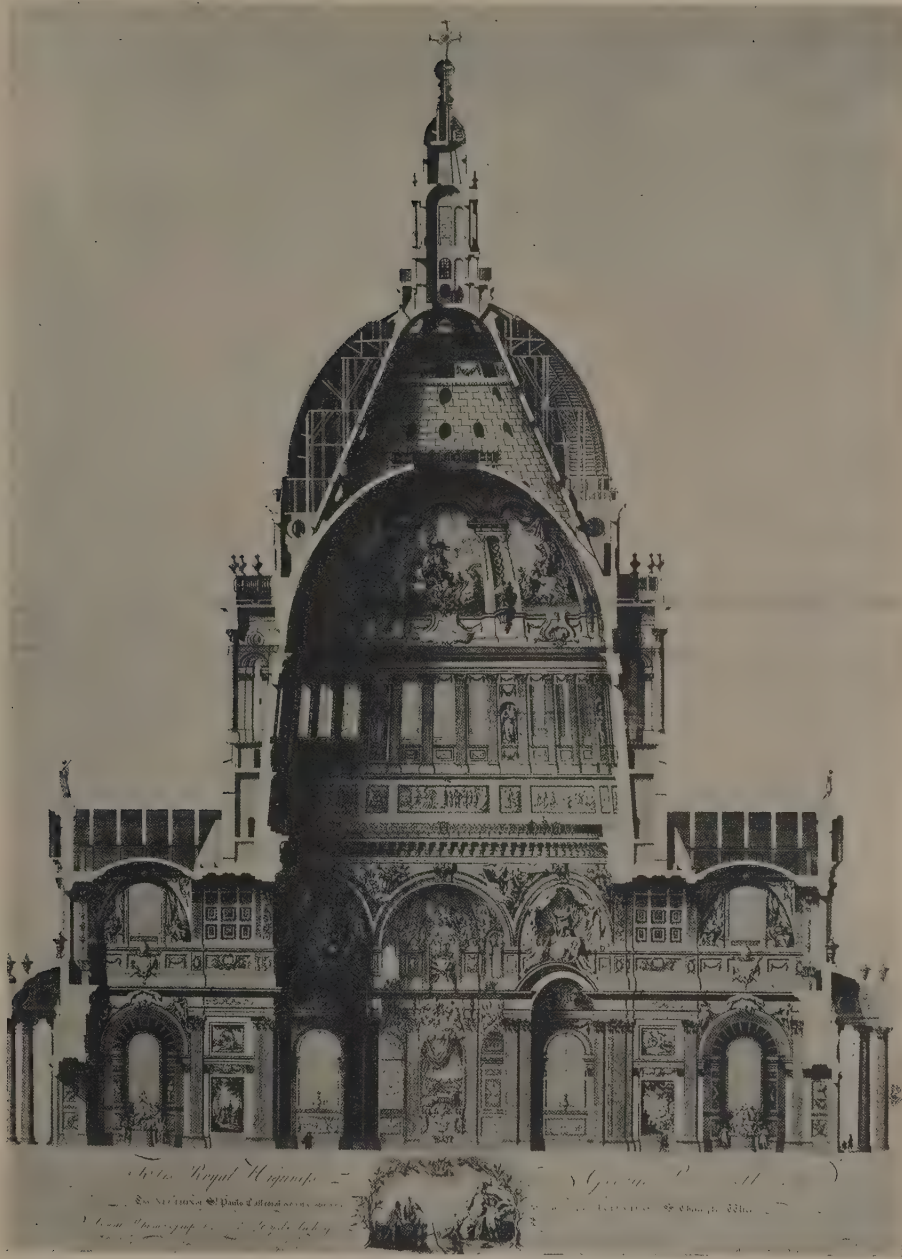


Fig. 358. Section of the dome of St. Paul's showing construction. (From the engraving by E. Rooker after S. Wale and J. Gwyn (1755))

It is not known for certain whether Wren had or had not an opportunity for making in Italy a preliminary study of the construction of double domes. Opinions

are divided in the matter. For my part, I believe that he must have gone at least to Rome, and that his visit has left its traces in more than one feature.

Such are the ambulatory or pseudo-triforium above the aisles ; the two stories of spherical vaults, one above the other, in the last or eastern bays of the nave aisles, and in the first of their prolongations beyond the transept ; and the depressed small domes resting on triangular pendentives. This feature recalls the church of the Gesù at Rome, the foundations of which were laid in 1568 from the plans of Barozzi da Vignola (1507-1573). After his death it was finished by Giacomo della Porta (1541-1604), who also designed the façade.¹

The balcony, too, round the outside of the drum recalls the one in Sangallo's model of St. Peter's. The influence of this model is also shown in the two bell-towers of the west front.

Besides, it seems very unlikely that so great an architect would have entered upon the construction of a double dome—a form which was new both to him and to England—without having first examined some existing example ; and what better example was there than the incomparable work of Michelangelo ? Carlo Fontana had not as yet given to the world his *Templum Vaticanum* (published in 1694), the earliest work on the subject, which might have served as a guide in this arduous enterprise.

¹ MILIZIA, op. cit., vol. ii, pp. 33, 119, 120. G. DE ROSSI, op. cit.

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